SIEMENS

MAMMOMAT 1000/3000 Nova

SP

Installation

Installation and Start-Up Instructions

from Serial No. 9000

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General

The configuration of the Mammomat installation is dependent on the customer's choice. Up to twelve various combinations are possible as shown below:

MAMMOMAT 1000

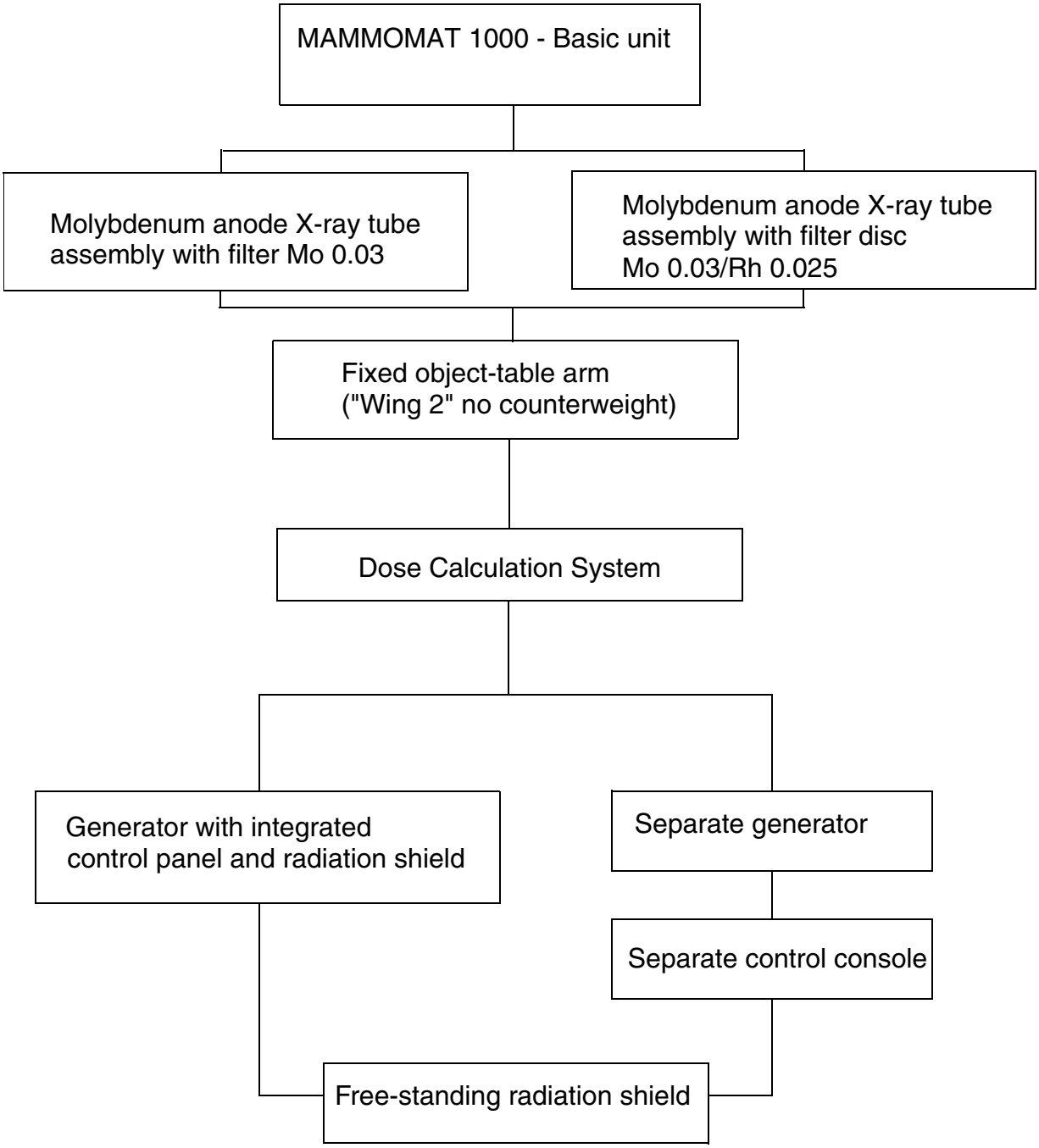
MAMMOMAT 1000 - Basic unit
Molybdenum anode X-ray tube assembly with filter Mo 0.03
Molybdenum anode X-ray tube assembly with filter disc Mo 0.03/Rh 0.025
Fixed object-table arm ("Wing 2" no counterweight)
Dose Calculation System
Generator with integrated control panel and radiation shield
Separate generator
Separate control console
Free-standing radiation shield

Fig. 1

MAMMOMAT 3000 Nova

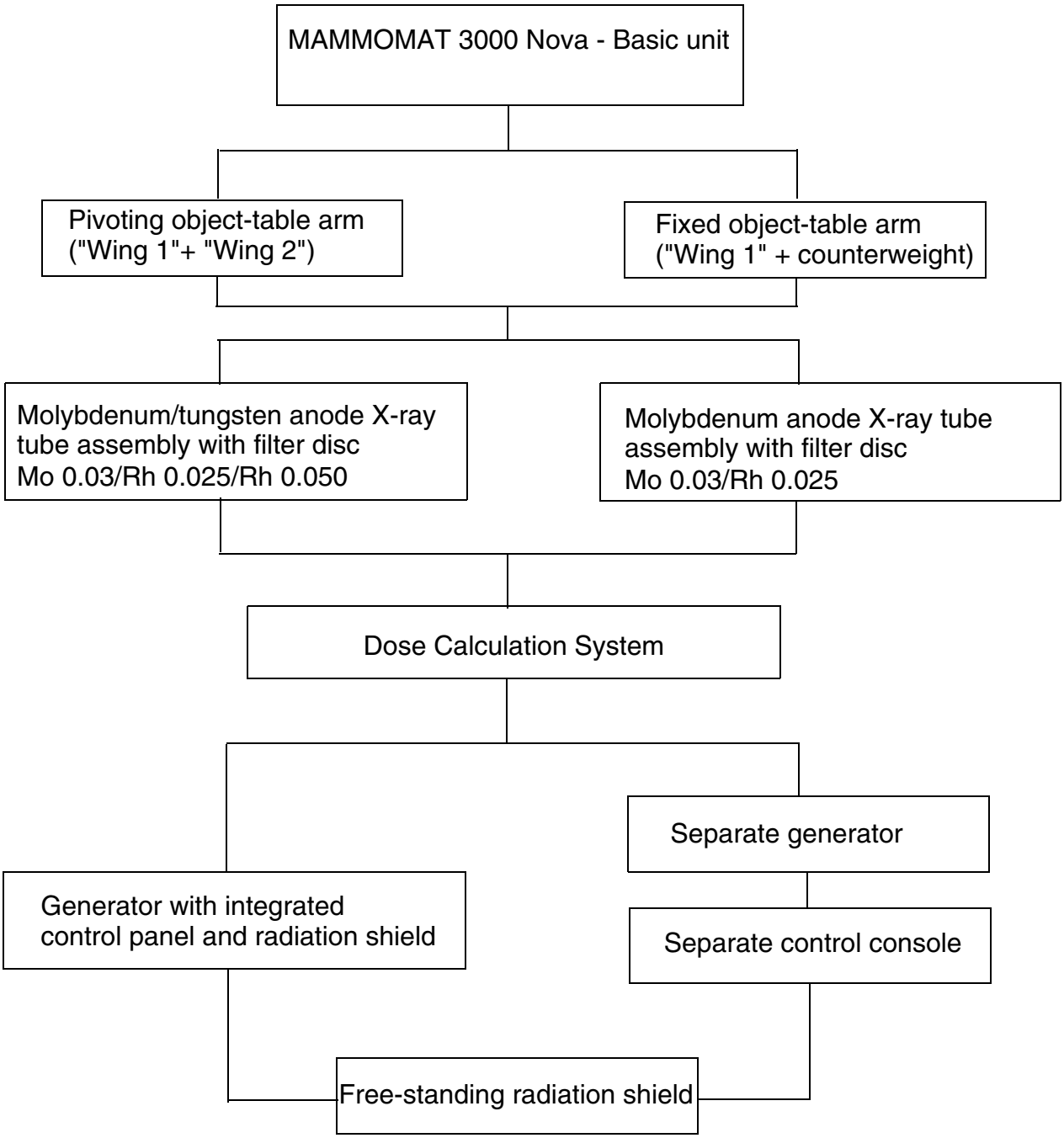
MAMMOMAT 3000 Nova - Basic unit
Pivoting object-table arm ("Wing 1"+ "Wing 2")
Fixed object-table arm ("Wing 1" + counterweight)
Molybdenum/tungsten anode X-ray tube assembly with filter disc Mo 0.03/Rh 0.025/Rh 0.050
Molybdenum anode X-ray tube assembly with filter disc Mo 0.03/Rh 0.025
Dose Calculation System
Separate generator
Generator with integrated control panel and radiation shield
Separate control console
Free-standing radiation shield

Fig. 2

NOTE

A P40 MoW tube will be delivered irrespective of whether the customer has chosen the molybdenum/tungsten anode X-ray tube or the molybdenum anode X-ray tube. In the last case, the tungsten anode is deselected by the software.

Unless otherwise stated, these instructions describe the stand with pivoted object-table arm and generator with integrated radiation shield and control panel.
Depending on the installation configuration, some points may be omitted.

Meters and appliances, tools

Meters and appliances required

NOTE	**Calibrated instruments are required.**

- Power Line Impedance Meter.
- Protective ground-wire tester.
- Oscilloscope, e.g TEKTRONIX 314.
- Digital multimeter (Fluke type 8060A, part no. 97 02 101 Y4290 or Fluke type 87, part no. 97 03 976 Y4290).
- Sensitometer.
- Densitometer e.g PDA 81.
- Service PC with connecting cable (PC-Generator), part no. 99 00 440 RE999.
- Normi 7 test body (provided by the customer) or SIB phantom Type 42 001 (PTW or INAK).
- Centering cross, part no. 96 60 051 RE 999.
- AEC calibration plexi:
  - Three plates, "2" cm (part no. 65 61 232)
  - One plate, "1" cm (part no. 65 61 224)

⚠WARNING	**The existing ground conductor in the mains cable must under no circumstances be disconnected when operating the oscilloscope.** **Life-threatening electric shock hazard exist.** **For those measurements, in which any resulting ground loop may falsify the measuring result, use the differential amplifier (difference measurement).**

Tools required

- Standard installation tool kit.
- Torque wrench for bolting the stand/generator to the floor (optional).
- Electrical screwdriver with adjustable torque is recommended.
- Calculator

This symbol indicates exposure of X-ray radiation.

Important notes on start-up

The **MAMMOMAT** is adjusted, programmed and tested in the factory, leaving the adaptation to the on-site mains voltage, adjustment of the AEC and the functional tests to be performed.

When the measurements to be made (kV, mAs, etc.) are within the tolerances stated in these instructions, this confirms that the settings made in the factory have not changed and the equipment is fully serviceable.

The measured values marked with ✍ in Chapter 10 "Checks with high voltage" shall be entered in the "start-up" column in the test certificate provided.

The service PC is required only for programming according to:

- **Chapter 10 "Checks with high voltage**"
- **Chapter 11 "Calibrating and adjusting the AEC**"
- **Chapter 12 "Dose Calculation System**"
- **Chapter 13 "Testing"**
- **Chapter 14 "Further programming"**
- **Chapter 20 "Final procedures**"

Description of the service PC syntax is found in Chapter 22 "Appendix".

NOTE	**If the generator is switched off with the service PC connected, wait approximately 5 s before switching it on again.**

Checking and recording for the area of application of the X-ray decree (§16 Germany)

In the area of application of the X-ray decree, an acceptance test certificate is supplied, with most of the data filled in by the factory.

Only:

- the cut-off dose
- the resolution of the film/screen systems used
- the output values of the constancy test

must be determined by the owner of the equipment and recorded in the acceptance test certificate. Furthermore, the front page of the acceptance test certificate must also be completed with the operator´s data.

Checking and recording for the DHHS area of application

In the area of application of the DHHS regulations, maintenance measurements must be made according to the "DHHS Maintenance Instructions" SPB7-230.662.03.04.02 and the "DHHS Supplements to the instructions for use" SPB7-230.661.02.03.02.

Sections

- Required labels.
- Radiation ON indicators.
- Manual termination of exposure.
- Checking the maximum adjustable mAs.
- Filters in beam limiting device (BLD).
- Reproducibility.
- kVp-accuracy.
- mAs-accuracy.
- Automatic exposure control (AEC).
- Coincidence of radiation field/image receptor.
- Alignment of light field/X-ray field.
- Illuminance of light localizer (light field).
- Shut-down of motor-driven compression movement.

The result must be recorded in "DHHS Measurement certificates"

SPB7-230.663.03.03.02.

Some of the values to be determined can be taken from the acceptance test certificate.

The radiation-field limitation is set at the factory and recorded in the acceptance test certificate.

If the measurements to be made concerning the radiation-field limitation are within the tolerances stated in these instructions, this confirms that the settings made at the factory have not changed.

Note on delivery state

The **MAMMOMAT** has been tested and adjusted at the factory, and should therefore be ready for operation after completion of the installation.

The equipment is set to 400 V, 2-phase, on delivery.

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Protective measures

It is very important that any intervention in the equipment will start with disconnecting it from the power supply with the main circuit-breaker. Before removing or inserting any of the printed circuit board, switch of the equipment. To prevent accidental triggering of high voltage and radiation, set the switch S2 (SS) on p.c. board D702 to "OFF" (lower position, no triggering of the SS relay).

⚠WARNING

If the system is only switched off at the control panel or with S2/D711, line voltage will still be present at the generator line connection, line filter Z1, Z2, transformer T1, transformer T10 and p.c. board D711 (see wiring diagram).

Life-threatening electric shock hazard exists.

Disconnect mains cable and comply with the information on this page.

⚠WARNING

After shut-down of the system, there may still be 380 V DC present on the intermediate circuit.

Life-threatening electric shock hazard exists.

The voltage level will be indicated by LED V24 on PC board D710. The voltage will drop to less than 30 V within about 3 minutes, the LED goes out at about 30 V.

⚠CAUTION

The p.c. boards contain electrostatic highly sensitive components.

If not regarded, the components could be damaged.

Use ESD-equipment, ground prior to making contact and place the components on a conductive surface.

⚠WARNING

The edges of the metal curtain of the stand are very sharp.

They may cause severe injury.

Apply the protective strips as mentioned in section "Protective strips for the metal curtain" on page 3 - 5 after removing the covers from the stand. Remove the protective strips only when the covers are to be mounted or when vertical adjustment of the swivel-arm system is necessary.

Delay times between two exposures

Delay times listed below must be followed in order to prevent the tube from overheating.

Exposure mAs value	Delay time between two exposures (seconds)
max 100	min 15
max 200	min 30
max 300	min 45
max 400	min 60
max 500	min 75

General

Scope of delivery

The **MAMMOMAT** is normally packed in one crate and one cardboard box (the number of packages is dependent on the customer's choice, however):

Crate (length 2140 mm, width 800 mm, height 1375 mm)

The crate contains:

- Compression plate
- Stand with X-ray tube assembly and base plate
- Object table 18 cm x 24 cm (Bucky)
- External diaphragm
- Cover panels
- Installation material
- Optional: Stanchions for the lead-glass pane (radiation shield)
- Cable ducts
- Technical documents

Cardboard box (lenght 1210 mm, width 820 mm, height 700 mm)

The cardboard box contains:

- Generator with high-voltage generator and base plate.
- Optional: Lead-glass pane
- Optional: Separate control console

Further accessories are packed in a separate cardboard box.

Unpacking

As a general rule, the directional marks on the crates should be observed during transport, storage and unpacking.

The stand crate is bolted together, while the cardboard box is secured with plastic straps.

⚠CAUTION	**The unpacking must be carfully performed.** **There's a risk for foot injuries when handling heavy parts.** **Wear safety footwear.**

Unpacking the stand

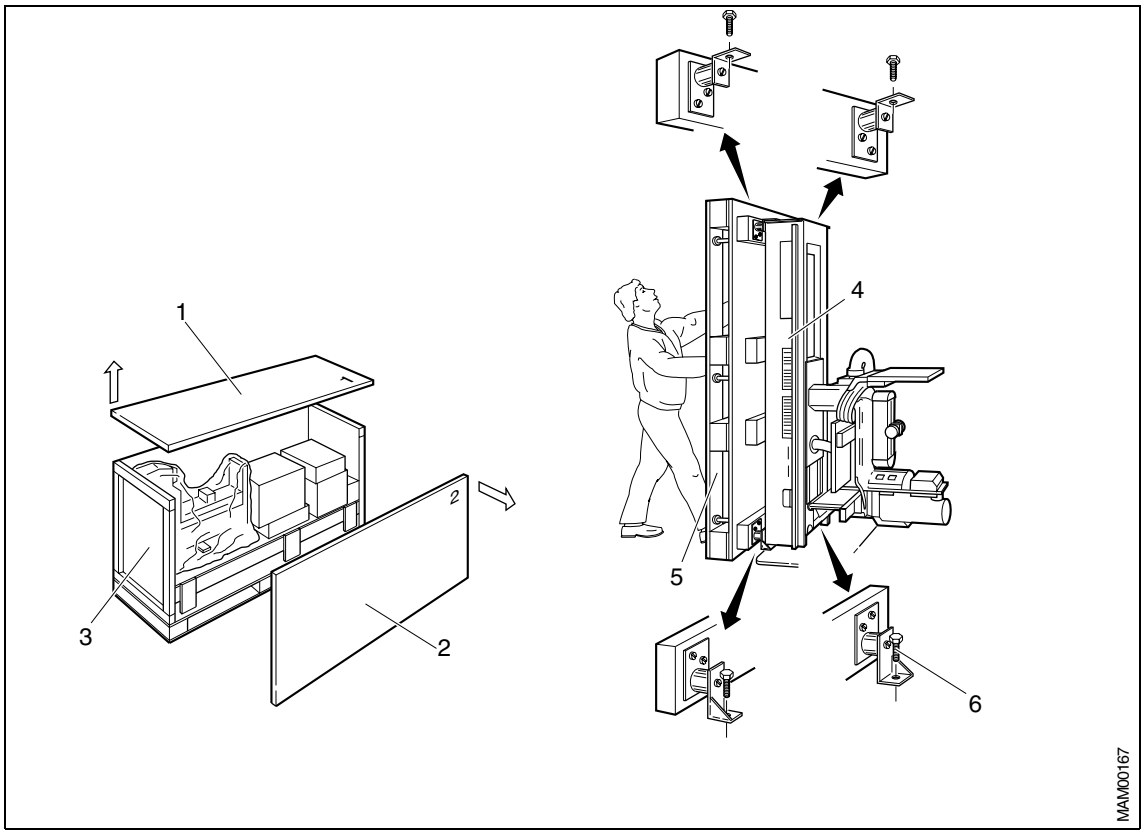

Fig. 1 Unpacking the stand

Unpacking

1. Open the stand crate by removing the top (1) and then the side wall (2).
2. Take out all enclosed packages (accessories, installation material, cover panels etc.) from the crate.
3. Remove the wooden supports.
4. Remove the remaining walls (3).
5. Upend the stand (4), with pallet (5) (two persons are required).
6. Loosen the four bolts (6) and remove the pallet (5).

Removing the transport safeguards

Removing the swivel-arm system transport safeguard

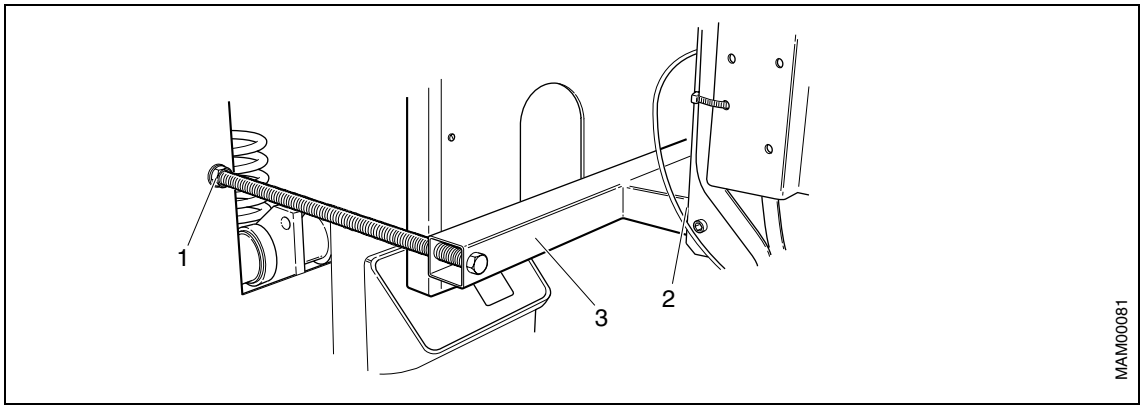

Fig. 2 Swivel-arm system transport safeguard

1. Loosen the transport safeguard nuts (1/Fig. 2) and remove the tube head screws (2/Fig. 2).
2. Push the red transport safeguard (3/Fig. 2) inwards, away from the tube head.

NOTE

Removal of the swivel-arm system transport safeguard is done after the equipment has been powered up, see further section "Attaching the swivel-arm covers" on page 7 - 1.

Transport safeguard for the lifting carriage

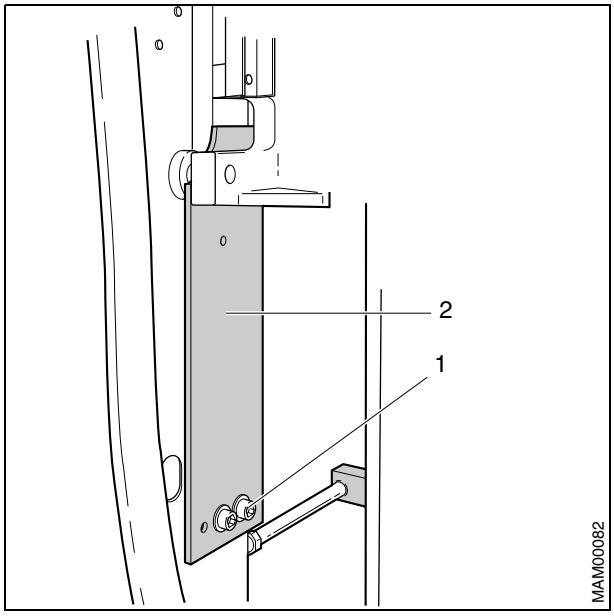

Fig. 3 Transport safeguard for the lifting carriage

1. Loosen the two screws (1/Fig. 3) and remove the red transport safeguard (2/Fig. 3). Reinsert screws (1/Fig. 3), they might be needed for service purposes.

NOTE	**The lifting carriage transport safeguard shall be kept for service purposes (Fig. 5).**

2. Cut and remove the cable tie securing the balancing spring during transport.

Transport safeguard for the rotary motion

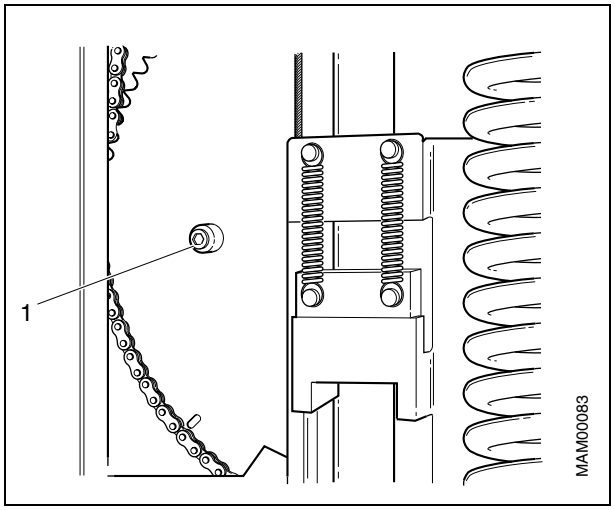

Fig. 4 Transport safeguard for the rotary motion

1. Remove the transport safeguard screw (1/Fig. 4) with spacer to enable rotary motion.
   The screw and the spacer should be kept for the mounting of the lifting carriage transport safeguard.
2. Mount the red lifting carriage transport safeguard with screw and spacer (1/Fig. 4) on the left hand side of the stand, see Fig. 5. Insert the screw through the slot from the inside of the stand, see Fig. 6

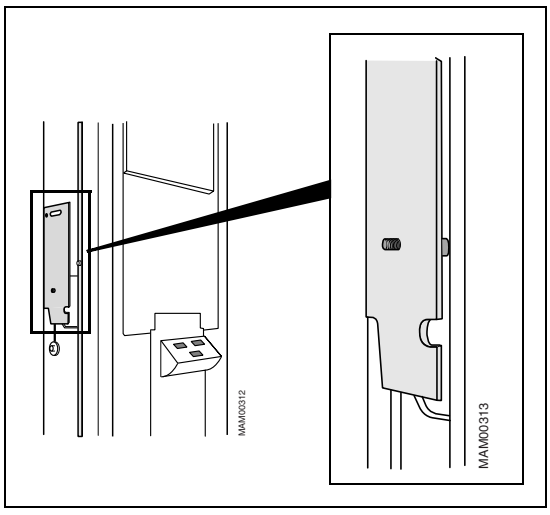

Fig. 5 Transport safeguard mounted on the stand

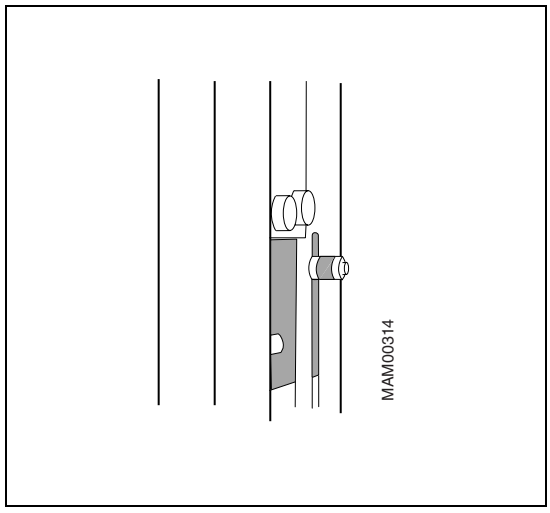

Fig. 6 Screw and spacer inserted from the inside of the stand

3. Tighten the screw. Make sure that the transport safeguard is parallell to the stand.

Ball bearings

The lifting carriage is equipped with twelve ball bearings (Fig. 7). Check that all twelve ball bearings are in place and that they show no sign of damage.

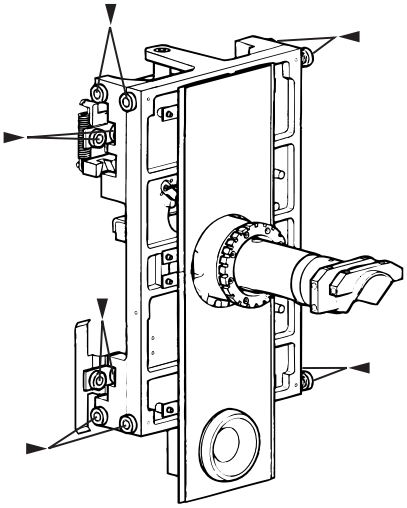

Fig. 7 Ball bearings

Protective strips for the metal curtain

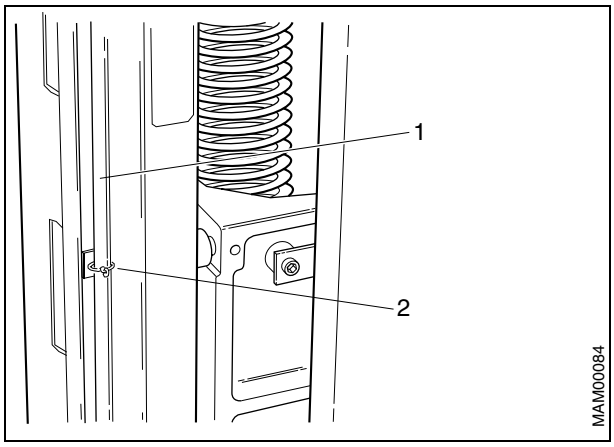

Fig. 8 Protective strips for the metal curtain

The edges of the metal curtain are very sharp and are therefore provided with protective strips (1) on delivery. These strips must always be applied onto the edges of the metal curtain during service and maintenance work.

⚠CAUTION

Remove the protective strips before performing vertical adjustment of the swivel arm.

If not removed, the protective strips could be damaged.

Make sure the protective strips are removed before adjustments.

Holders (2) for storing the protective strips when not in use, are provided on both sides of the curtain, see Fig. 8.

Unpacking the generator and mounting the radiation shield (optional)

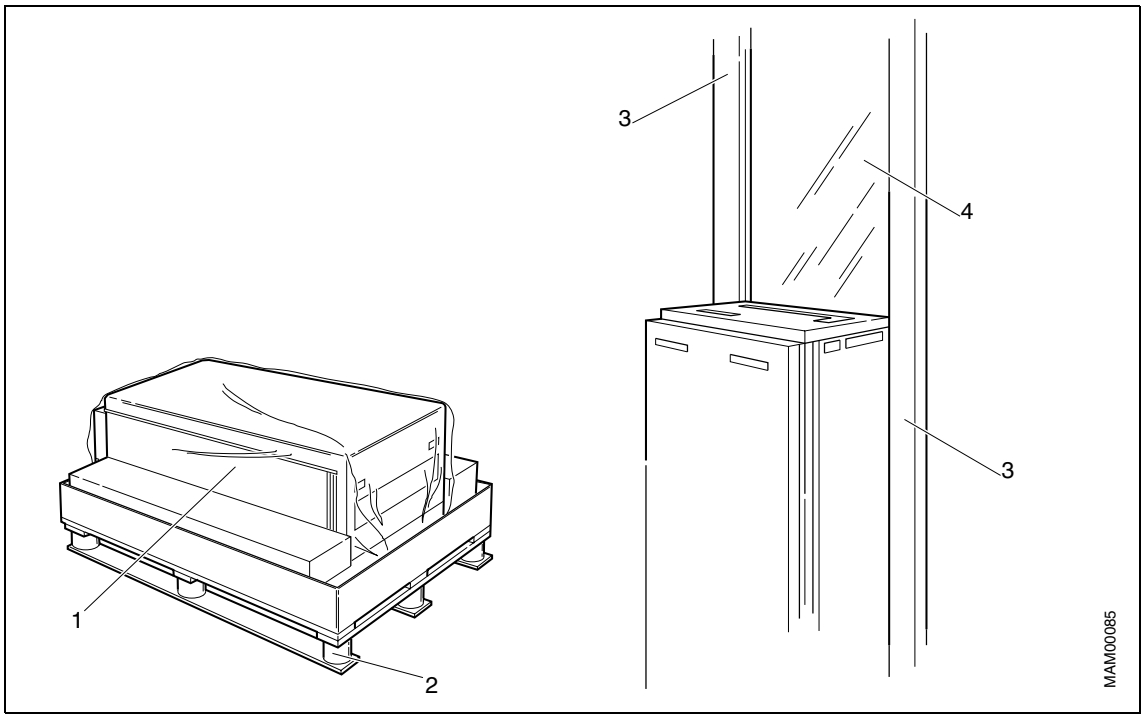

Fig. 9 Unpacking the generator

1. Open the cardboard box by cutting the plastic straps.
2. Lift out the lead-glass and put it away in a safe place.
3. Remove the protective cover from the generator.
4. Upend the generator (1/Fig. 9) and lift it off the pallet (2/Fig. 9) (two persons are required).

Optional:

5. Insert sheet-metal strip (5/Fig. 10) (additional radiation protection) into both stanchions.
6. Fit the lead-glass (4/Fig. 10) into both vibration absorbing strips (6/Fig. 10) and fix it softly by screws (1/Fig. 10).

NOTE **The screws must be mounted before the lead-glass is inserted in the stanchions.**

7. Fit the lead-glass (2/Fig. 10) into the groove of one of the stanchions (3 /Fig. 10) and keep it in position while mounting the other stanchion (3 /Fig. 10).
8. Mount the stanchions and lead-glass unit with 6 screws onto the generator (3, 4 /Fig. 9) (two persons are required).
9. Cover the holes with plastic caps (7/Fig. 10).

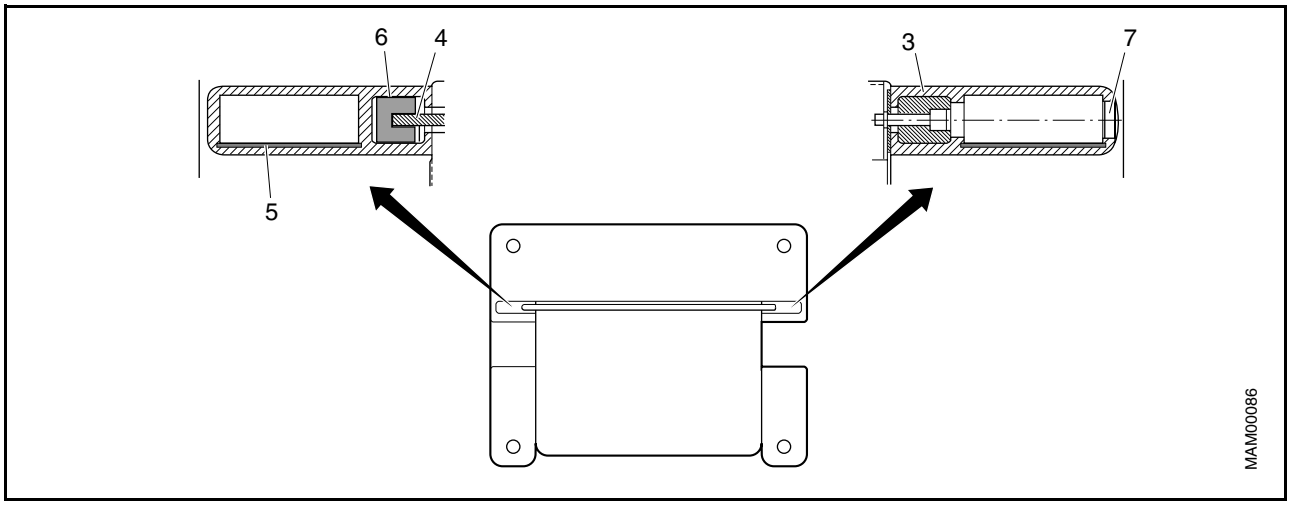

Fig. 10 Mounting the radiation shield

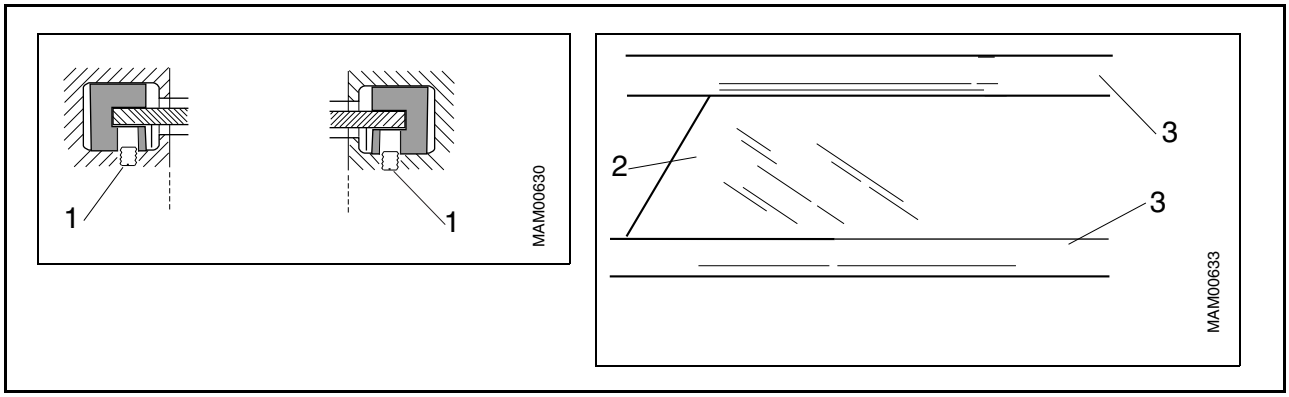

Fig. 10

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Arranging the components

Position the stand and the generator in accordance with installation plan and Fig. 1 below.

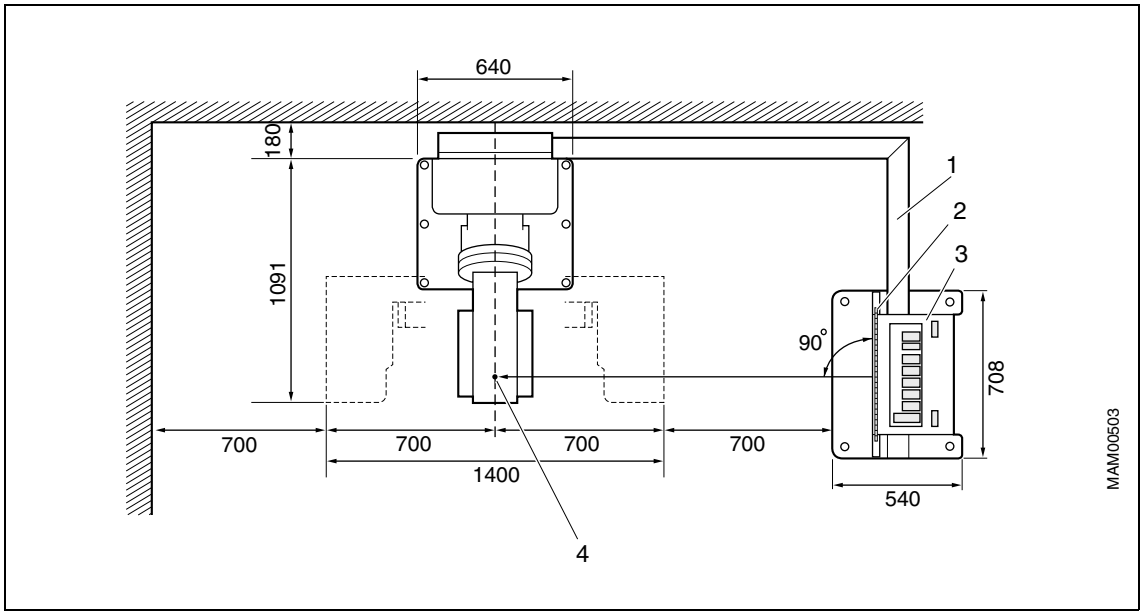

Fig. 1 Installation, top view

Cable duct (1) and generator (3) with radiation shield (2) can be installed optionally to the left or to the right of the the stand. The cables can also be laid underfloor. Maximum cable length between stand and generator is approximately 3.5 m.

Radiation shield (2) at right angles to the swivel-arm system and centered to the focus mark (4) on the tube-head cover according to Fig. 1.

Recommended minimum distance to wall and generator base plate respectively is 700 mm (shorter distances may be used at the customer´s desire, if in compliance with local regulations).

For the installation of the cable duct, a minimum distance of 180 mm between wall and stands is required.

Notes on installations with separate generator and separate control console

- The separate generator can be installed in any suitable place. The maximum distance of 3.5 m (maximum cable length) to the stand must be maintained, however. If separately installed, the generator must be bolted to the floor alternatively be attached to the wall by means of wall brackets, see further Chapter 21 "Bolting the stand/ generator to the floor".

- The separate control console can be installed in a suitable place (wall-mounted or mounted on a table, for example in an adjacent room with radiation-proof window), or be mounted onto the free-standing radiation shield (option). The connection cable to the generator measures 10 m.

Free-standing radiation shield (option)

For the installation of the free-standing radiation shield, please refer to separate instructions enclosed with the radiation shield.

Removing the generator cover

1. Pry loose the plastic strip (1) and remove the sixteen screws (2), eight on each side.

NOTICE

Pay special attention to the contact washers (there are four contact washers on either side).

They are needed again when reassembling the front cover to establish protective ground connection and to fulfil EMC (Electro Magnetic Compatibility) requirements.

2. Remove the front cover (3) from the generator.

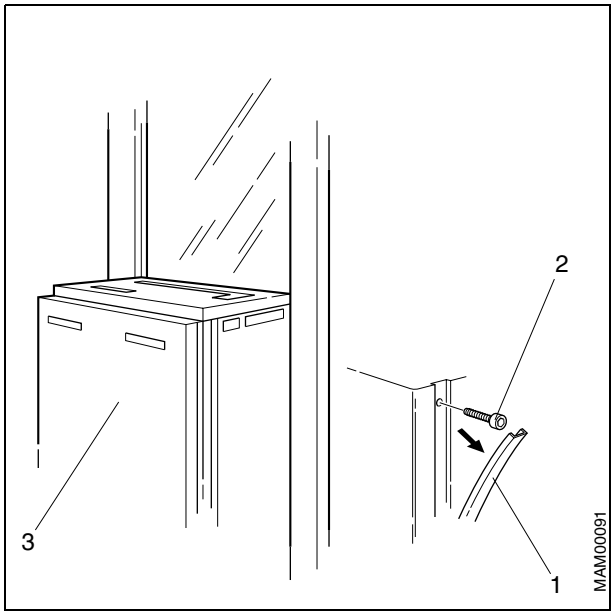

Fig. 2 Removing the generator cover

Installing the cable ducts

1. Position the cable ducts (1) to the stand and the generator respectively.
2. Leave sufficient space, approx 10 mm between the cable ducts (1) and the base plate of the stand (3) to allow for the mounting of the cable outlet cover (4).
3. Check that the cable duct (1) is slightly overlapped by the cable outlet cover (4).

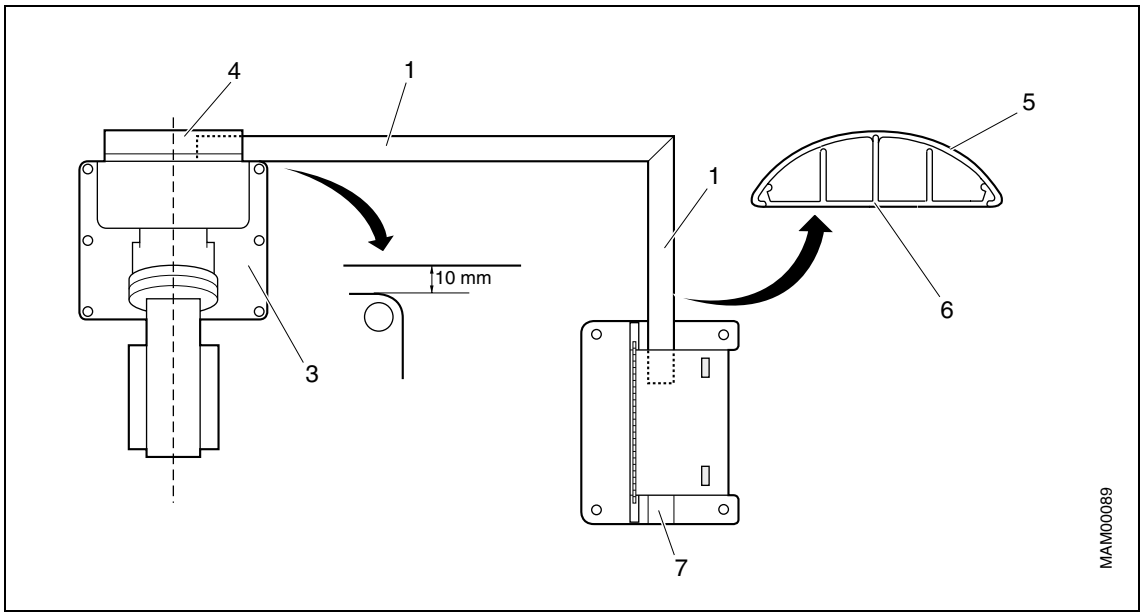

Fig. 3 Installing the cable ducts (top view)

1. Mark the outlines of the cable ducts (1) on the floor.
2. Cut the bottom of the cable ducts (6) and the cable duct cover (5) to proper length.

NOTICE

Fig. 3 shows a right-angled installation of the cable ducts.

If the generator is to be installed at an other angle to the stand, you just have to cut the cable ducts correspondingly.

3. Fasten the bottom plate of the cable ducts (6) to the floor according to marking, using double-sided adhesive tape.
4. At the generator, cover the cable entry not used with the enclosed cover plate (7).

Installations with separate control console

For the connection cable separate control console – generator, additional cable ducts are required, unless the cables are to be laid underfloor.

Laying the cable harness

NOTE **Remove the transport safeguards which consist of cable ties (four around the cable harness and one at the end of each shielded cable).**

1. Separate the cable harness.
2. Lay the stand cable harness in the cable duct, as shown in Fig. 4, all the way to the generator.
3. Fit the cable duct covers (6) onto the cable ducts.

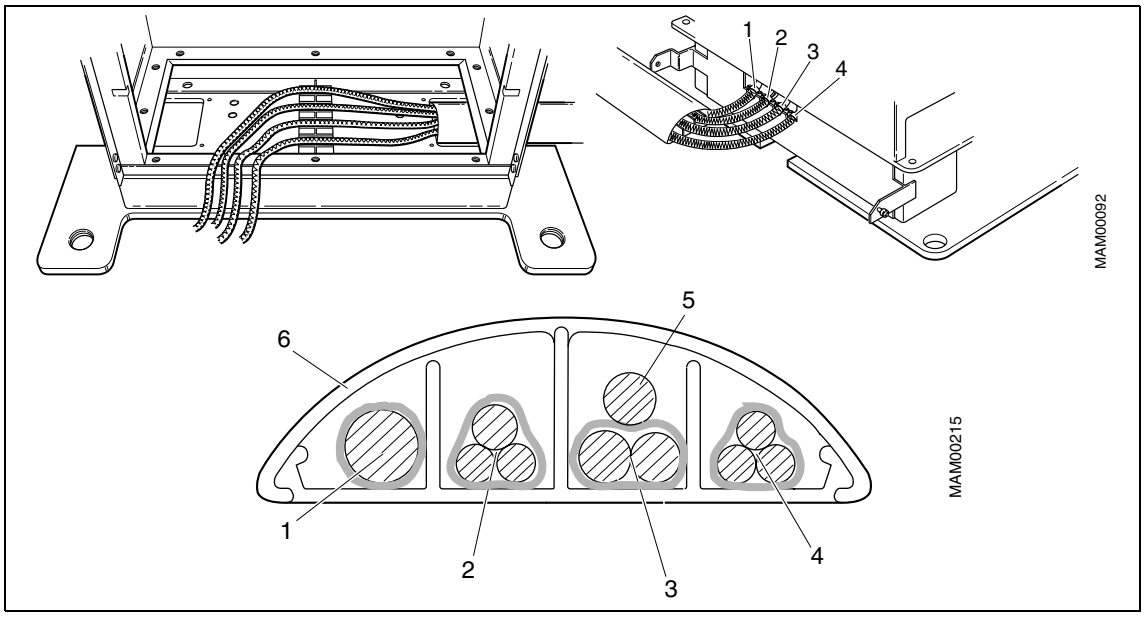

Fig. 4 Laying the cable harness

The cable harness consists of four shielded cables, see Fig. 4.

Pos in Fig. 4	Description
1	High voltage cable H1
2	AEC signal cables X10 and X11 Unit control cable X1 Power supply cable X14
3	Anode rotation cable X9 Filament cable X8
4	Mains supply cables L1, L2 Protective ground
5	Decompression-button cable (only with separate control console)

Installations with separate control console

Lay the connecting cable from the control console in additional cable ducts, alternatively underfloor, to the free cable entry of the generator, see further section on page 5 - 8.

The separate control console can be wall-mounted – horizontally or vertically as shown in Fig. 5 below – or be mounted on a table, either in the examination room or in an adjacent room with radiation-proof window. It is important that the control console be placed so that the operator has good view of the patient from the control console.

Ensure that the control console is attached to the wall with adequate safety margins. Dowels and screws are not supplied. Please obtain these locally and ensure that they are suitable for the material used in the wall. The separate control console has a weight of 4 kg.

There are two cable outlets on the separate control console; one at the back and one on the underside. On delivery, the cable is led through the outlet at the back of the control console. For wall-mounted control console, the cable shall be led through the outlet on the underside.

If the control console is to be mounted on a table, the minimum/maximum length of the screws penetrating into the control console must be observed, see Fig. 7 below.

The control console can also be mounted on the free-standing radiation shield (option) as shown in Fig. 6 below, see separate instructions enclosed with the radiation shield.

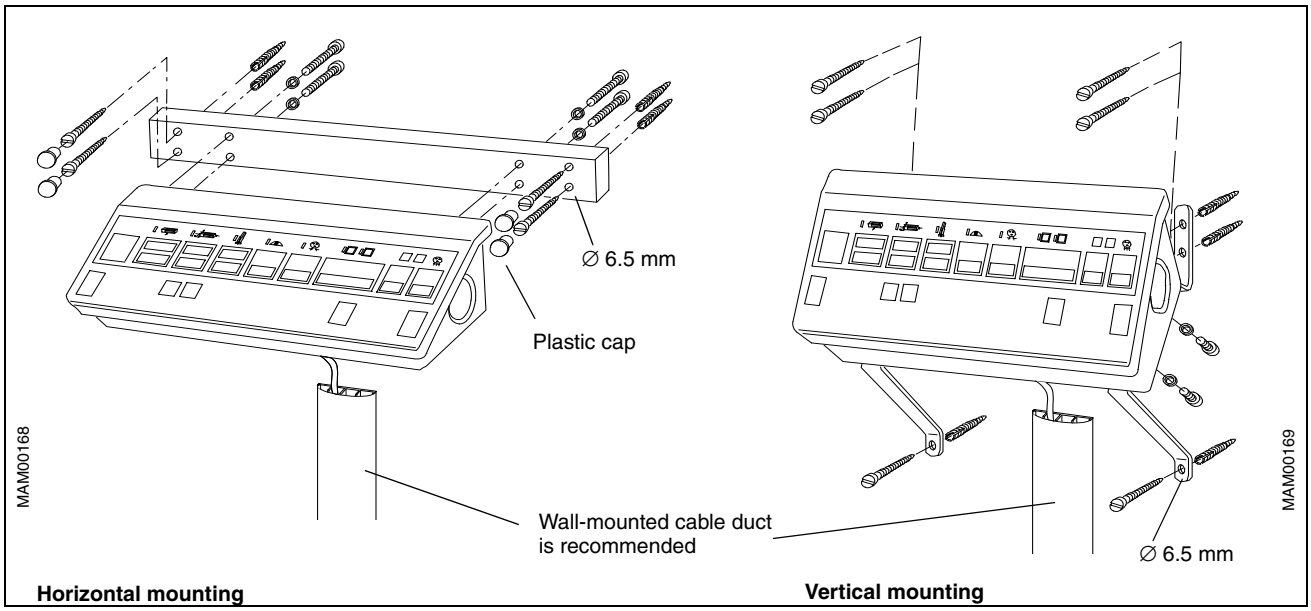

Fig. 5 Wall-mounted control console

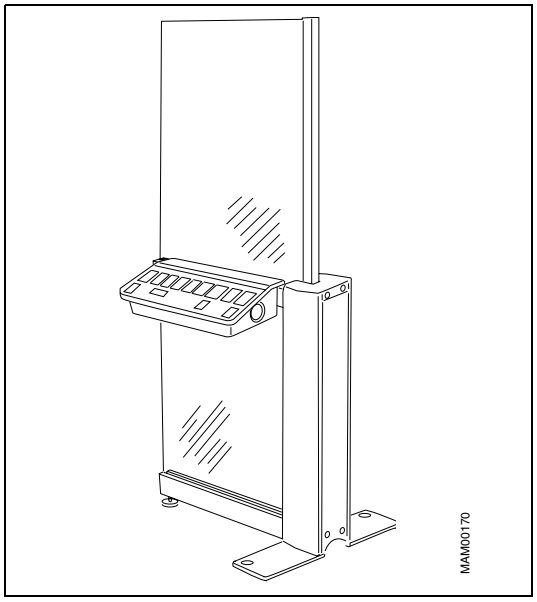

Fig. 6 Control console on free-standing radiation shield (option)

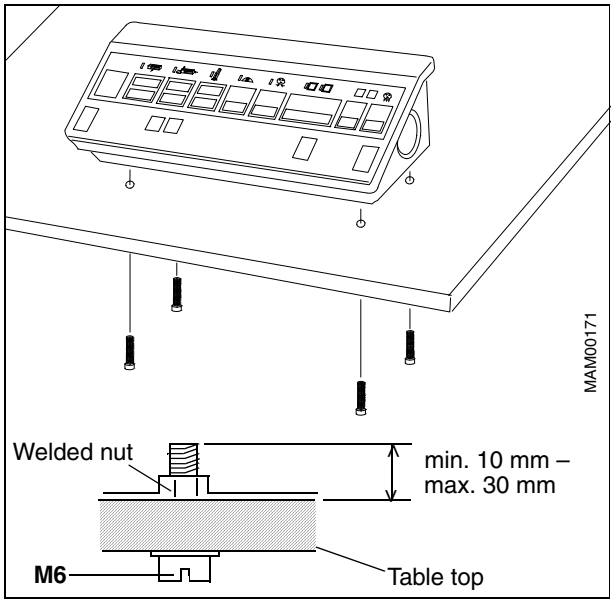

Fig. 7 Control console mounted on table

Aligning the stand

1. Align the stand vertically by means of the levelling screws (1/Fig. 8).
   For adjustment of the levelling screws, use a ratchet spanner 1/2" with extension (without socket).

NOTICE

It is important that all six screws bear against the floor.

This is to ensure optimum stability of the stand.

2. Cover the levelling screws with the cover discs supplied.

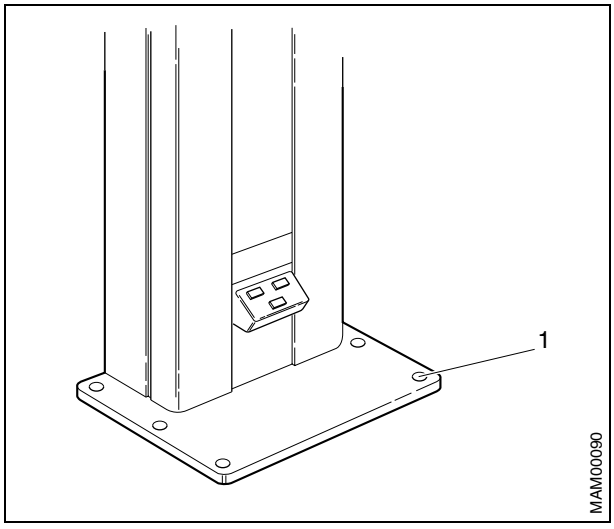

Fig. 8 Levelling screws

NOTE

If bolting to the floor is required, please refer to Chapter 21 "Bolting the stand/generator to the floor" on page 21 - 1.

EMC measures

The following measures are required to ensure electromagnetic compatibility of the equipment.

EMC measures at the cable entry

Fitting the hose clamps and ferrite sleeves

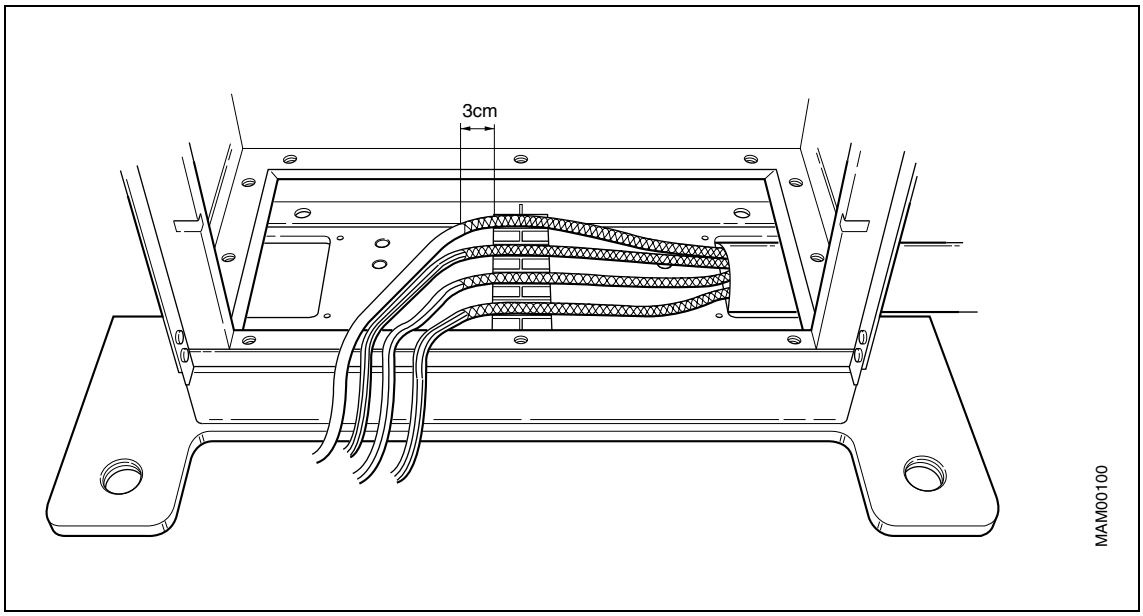

Fig. 1 Cables from the stand

1. Lay the cable harness from the stand to the generator and leave approximately 3 cm of the shielding at the U-bracket, see Fig. 1.
   Stow away excessive cable lengths as shown in Fig. 2.

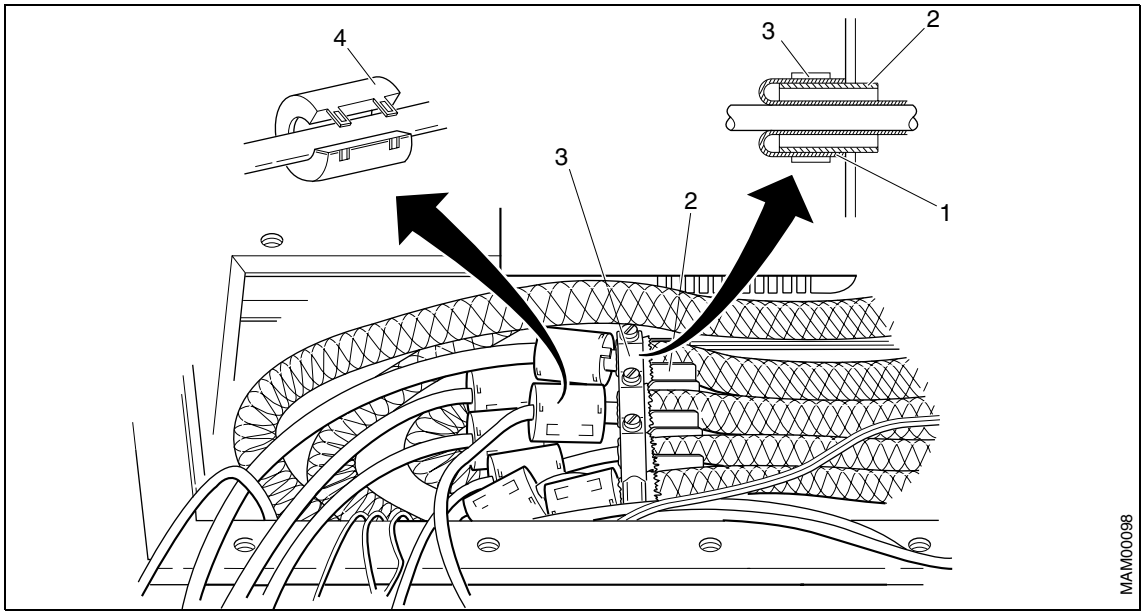

Fig. 2 Ferrite sleeves and hose clamp

2. Provide each incoming cable with a ferrite sleeve (4), except for mains supply cables L1 and L2 and the ground wire, which shall be laid together in one and the same ferrite sleeve. Ferrite sleeves are included in the delivery.
3. Provide each cable with a hose clamp (3). Hose clamps are included in the delivery.
4. Fold the shield braid (1) backwards over the U-bracket (2) on each cable and secure with the hose clamp (3).

Note on separate control console and separate generator

If the installation includes a separate control console and separate generator, please refer to page 5 - 8 for information on how to install the additional connection cable between the control console and the generator.

EMC measures on the bottom plate

Fitting the cables X1, X8 and X9 onto the bottom plate

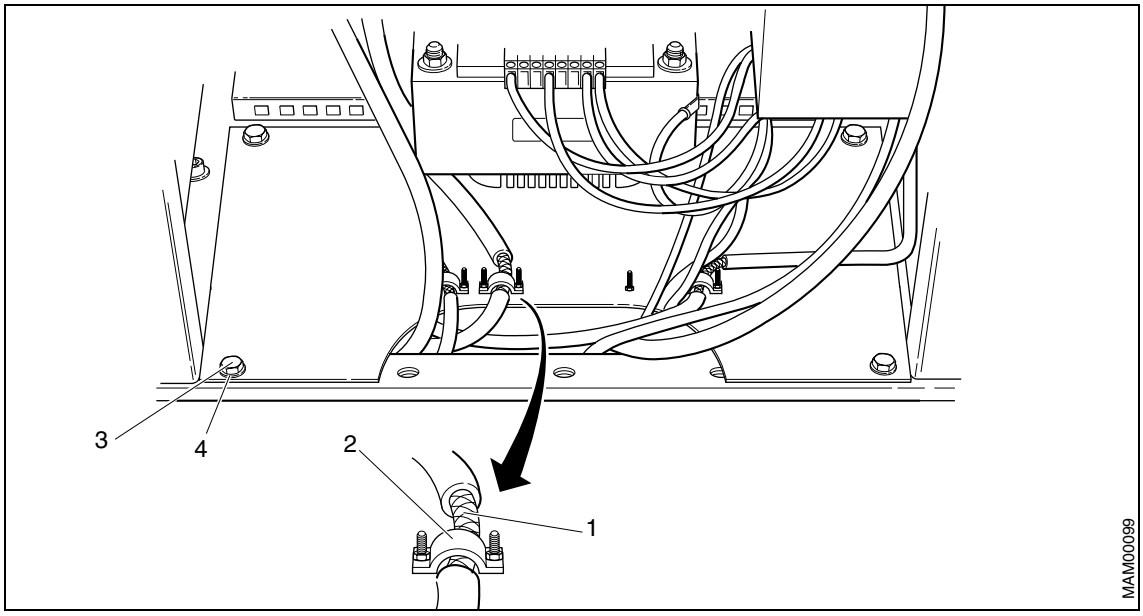

Fig. 3 Bottom plate

1. Fit the bottom plate at the bottom of the generator stand as shown in Fig. 3.
2. Carefully cut away the insulation on cables X1, X8 and X9 to lay bare the shield braid (1).
3. Select proper clamps (2) with regard to the thickness of the cables. Cable clamps in different sizes are provided on the bottom plate.
4. Fit the clamp (2) over the shield braid and screw tight to ensure satisfactory contact between shield braid and clamp.

NOTE	**Make sure that all excess cable lengths are placed below the bottom plate.**

5. Fasten the bottom plate with four screws (3) and contact washers (4).

NOTE	**Cable X9 shall also be clamped to the side wall of the cabinet, if not already done, see Fig. 7 in this chapter.**

NOTE	**Do not remove insulation and do not ground the shields of the AEC signal cables to X10 and X11.**

Connecting the stand cable-harness

High-voltage connector

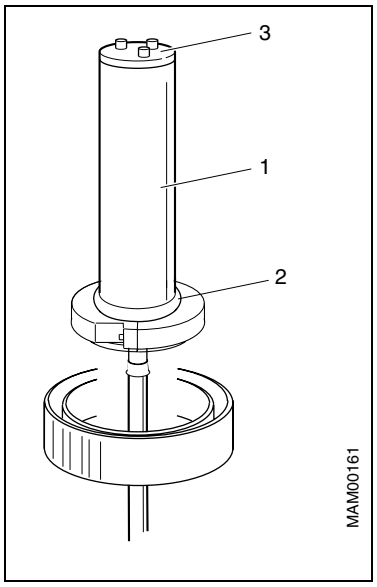

Fig. 4 High-voltage connector

NOTICE

The high-voltage connector (1) is factory-adjusted for correct fit.

The high-voltage connector shall be inserted with silicone oil, silicone-rubber ring (2) and silicone-rubber disc (3). Lubricate the silicone-rubber disc and the pins with silicon oil before mounting the disc. Make sure that there aren't any air bubbles between the disc and the connector.

Connecting the high-voltage connector

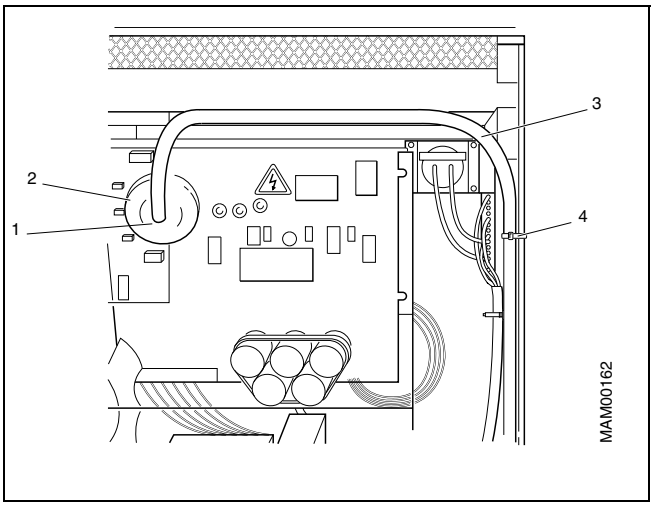

Fig. 5 Connecting the high-voltage connector

1. Plug in the high-voltage connector (1) at H1.
2. Tighten the sleeve nut (2) by hand.
3. Tighten the stop screws on the sleeve nut.
4. Position the high-voltage cable (3) to the right in the generator and fasten with cable ties (4).

Connecting the cable harness to the generator

NOTICE

EMC measures required.

They are described on page 5 - 1 in this chapter.

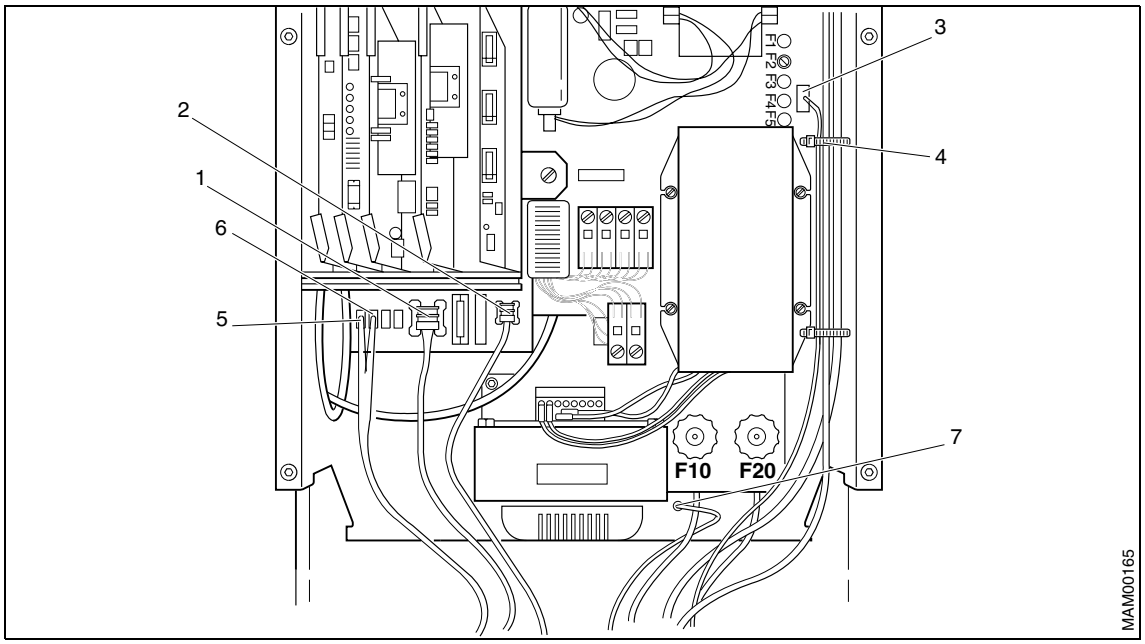

Fig. 6 Cable harness at the generator

Unit control cable X1

1. Connect the unit control cable X1 to D700 X1 (1).

Filament cable X8

1. Connect the filament cable X8 to D700 X8 (2).

Power supply cable X14

1. Connect the power supply cable X14 to D711 X14 (3).
2. Strain-relieve it on the side with a cable tie (4).

AEC signal cable X10 and X11

NOTE

The AEC signal cable consists of two cables laid together as one cable with two connectors labeled X10 and X11 at the end of the cable.

1. Connect the AEC signal cable connectors, X10 and X11, to D700 X10 (5) and X11 (6).

Rotating anode cable X9

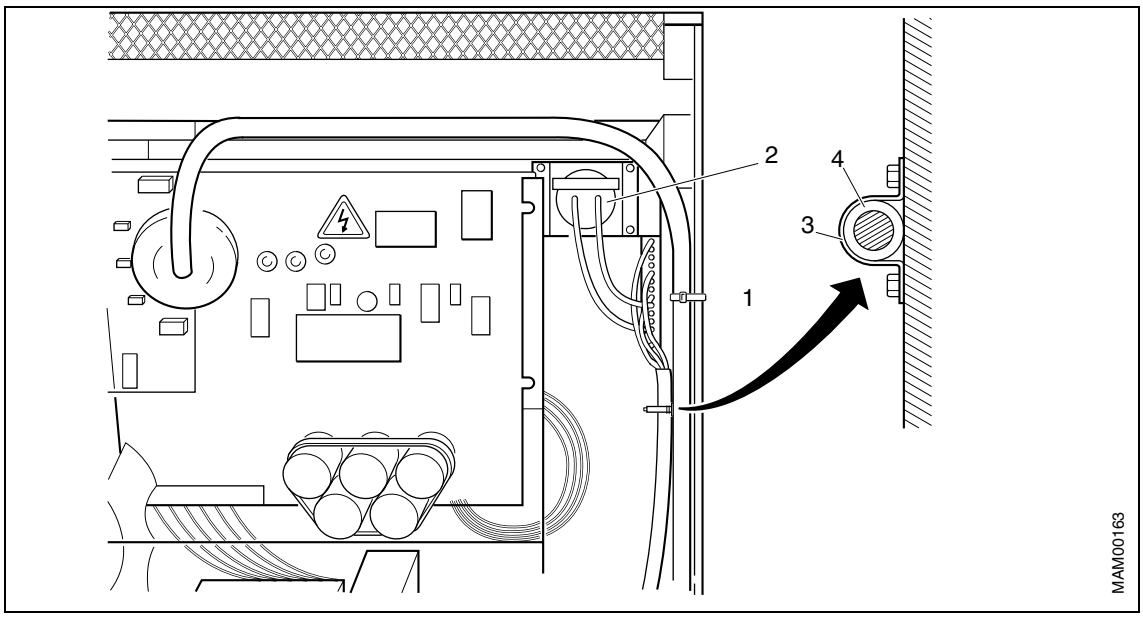

Fig. 7 Connecting X9 to the generator

1. Connect the rotating anode cable X9 to D711 X9 (1).
2. Connect the two blue free wires from connector D711 X9 (1) to capacitor C51 (2).
3. Clamp the cable to the chassis with a cable clamp (3).

NOTICE

Obtain proper grounding.

When fitting the cable clamp, ensure satisfactory contact between shield braid (pos. 4 / Fig. 7) and chassis.

Installations with separate control console and separate generator

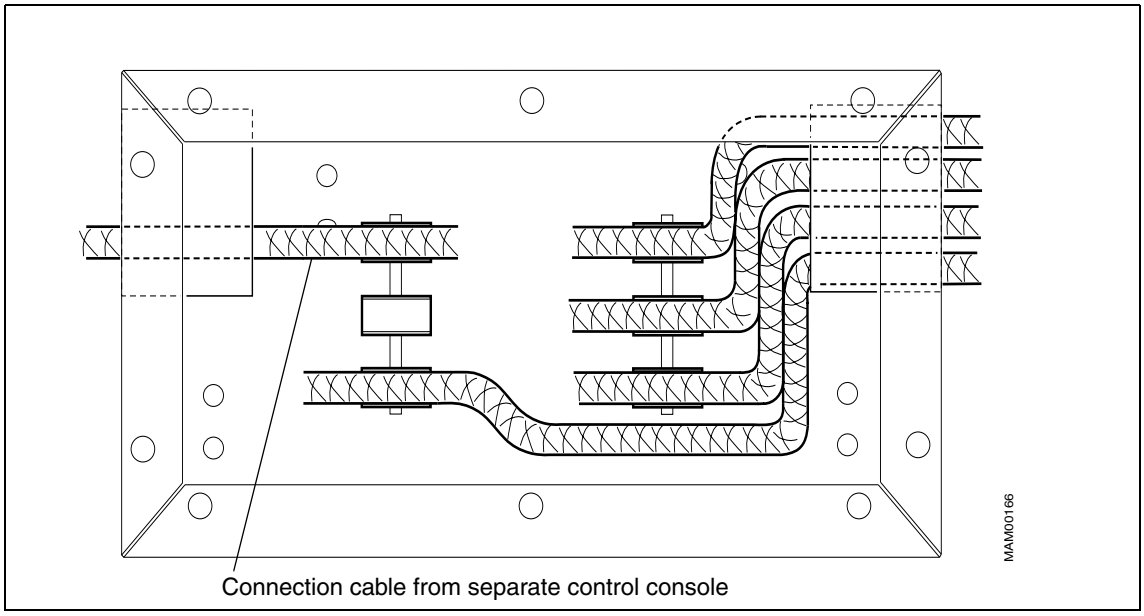

Fig. 8 Connection cable from separate control console

NOTICE

Comply with EMC regulations!

The cable must be shielded from the separate control console as described below.

1. Lay the connection cable from the separate control console in additional cable ducts, alternatively underfloor, to the free cable entry of the generator, see Fig. 8.
2. Lay the connection cable in a free U-bracket. Fold the shield braid over the U-bracket and secure with a hose clamp as shown in Fig. 9.

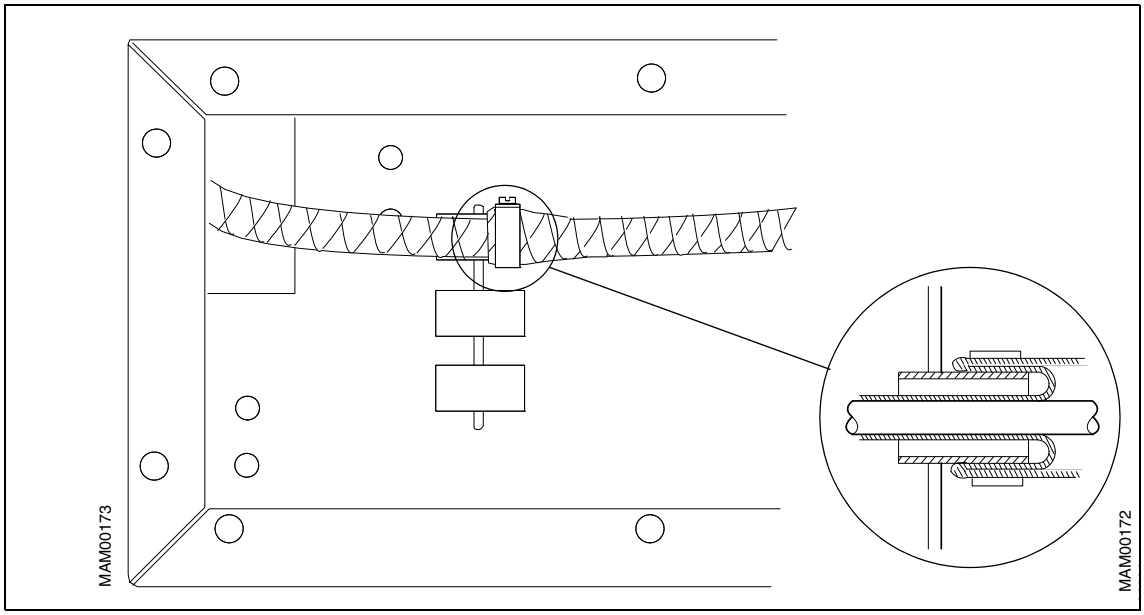

Fig. 9 Shielding the control console cable

3. Shield the control console cable to the bottom plate of the generator as shown in Fig. 10.
4. Provide the cables with ferrite sleeves. Cables X5 and X32 can be laid together in one ferrite sleeve, X30 and the decompression-button cable in another sleeve (two extra ferrite sleeves are included in the delivery). Plug together the decompression button cables. Shield the decompression button cable to the bottom plate, see Fig. 10. Lay the decompression button cable in the cable duct, alter-natively underfloor, to the stand, see Fig. 4 in Chapter 4 "Installing the generator and the stand".

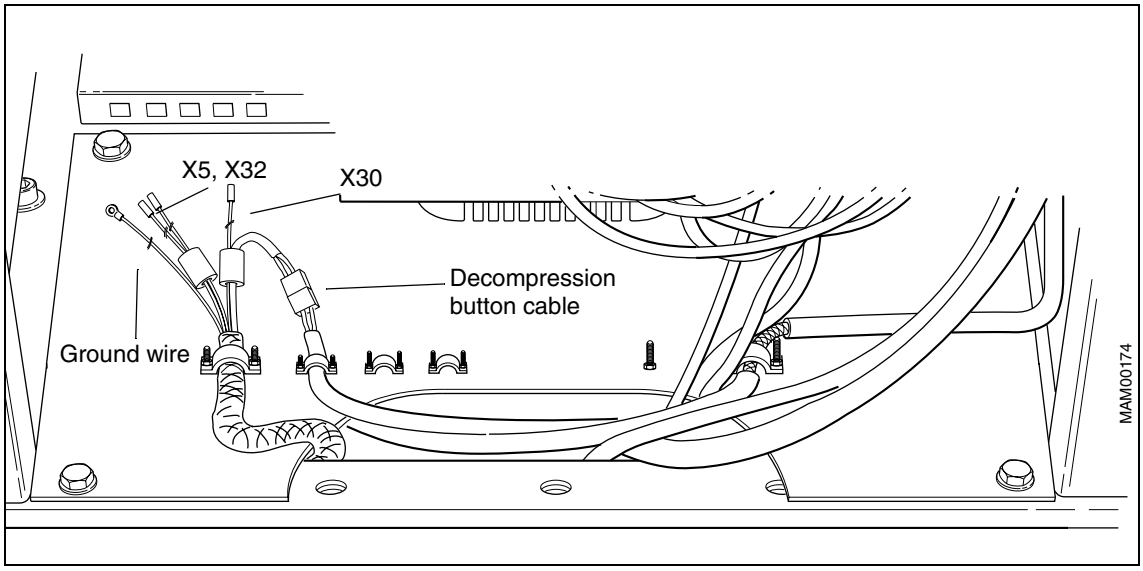

Fig. 10 Cables from separate control console

5. Connect X5 and X32 to the corresponding sockets on circuit board D700, X30 to connector T3/X30 at the side of the circuit board chassis. Connect the ground wire to the protective ground terminal below fuse F10, see Fig. 11.

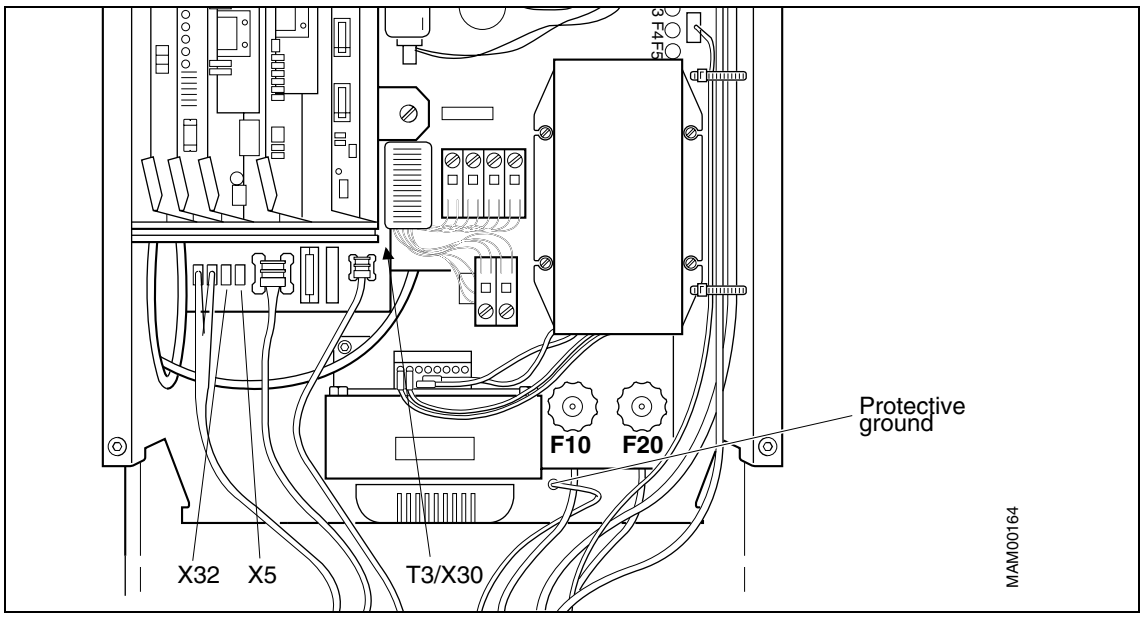

Fig. 11 Connecting the cables from the separate control console

6. Shield the decompression button cable to the stand chassis as shown in Fig. 12. Connect to terminals 2 and 3 in terminal block X803 on the inside of the stand chassis, see Fig. 12.

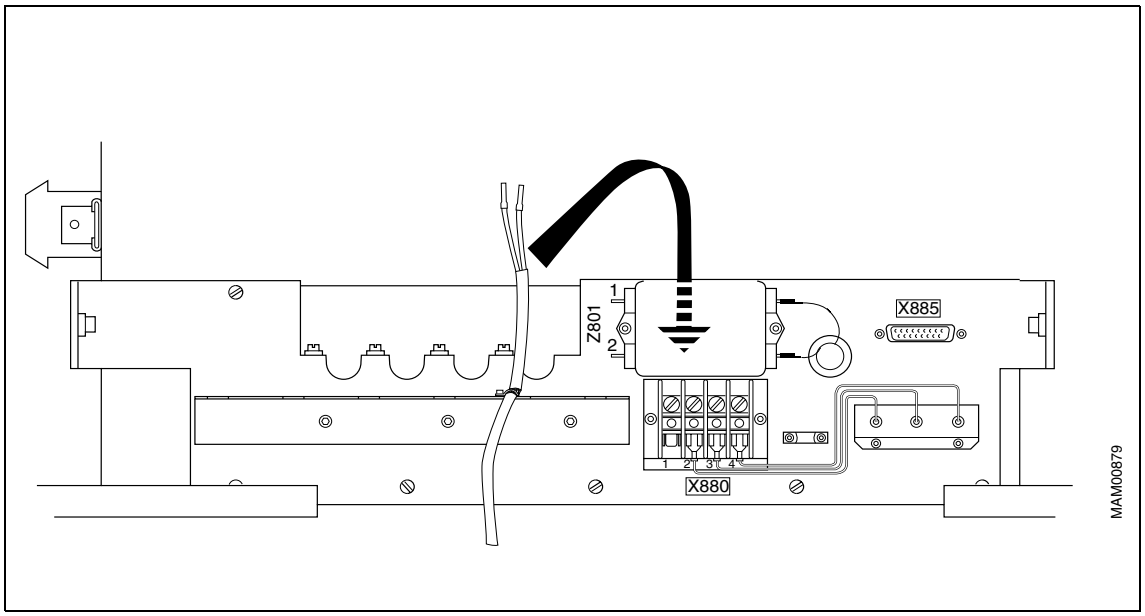

Fig. 12 Connecting the decompression button cable at the stand

Main voltage connection

The equipment has been set to 400 V, 2-phase, in the factory (see test certificate). Adjustment to the line frequency is not needed. If the mains voltage is not 400 V, 2-phase at the installation site, a reconnection of the mains is necessary.

Should a reconnection for the mains voltage be necessary, this must be done at transformer T10 as well as p.c. board D711 (insertion or removal of fuses and labeling is specified in the wiring diagram, see Line Input page 5-3).

Change the rated voltage labels to the correct voltage (there are two labels on the generator and one on the stand). Labels are included in the installation material.

NOTE	**For more details about changing mains, insertion or removal of jumpers, fuses, labeling etc., see Wiring Diagram.**

Connecting the incoming mains to the stand (400 V, 2-phase)

400 V 2-phase connection

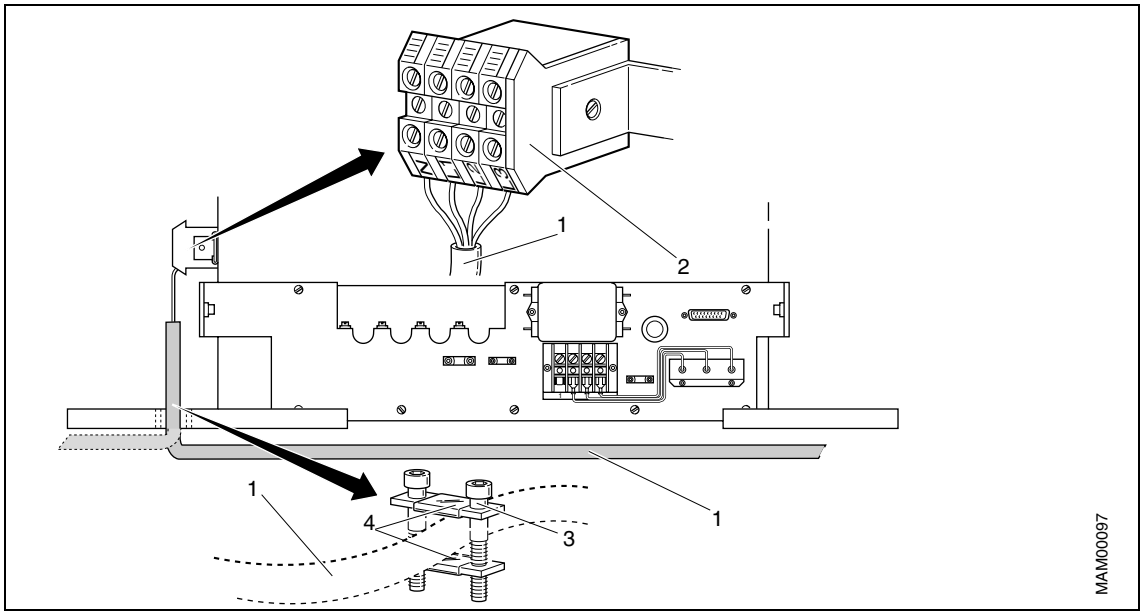

Fig. 13 Incoming mains cable

1. Connect the incoming mains cable (1) to X899 (2) in the stand as shown in Fig. 13 and Fig. 14.
2. Fit plastic tubes (4) on the plates.
3. Strain-relieve (3) the incoming mains cable.

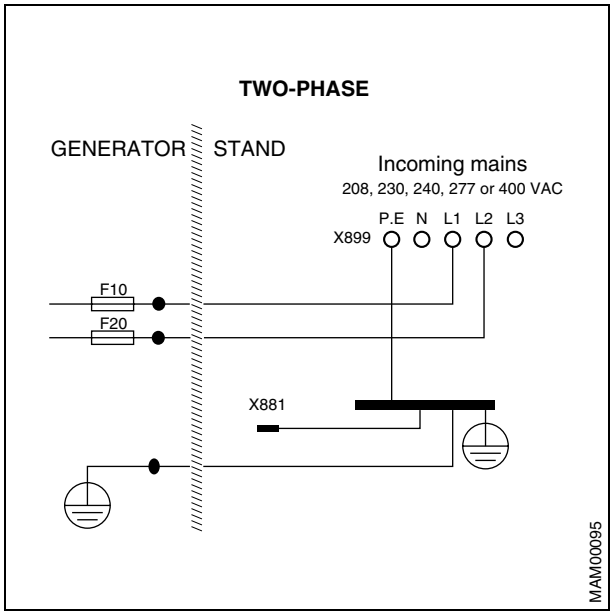

Fig. 14 Incoming mains, 2-phase

Connecting the mains supply to the generator (400 V, 2-phase)

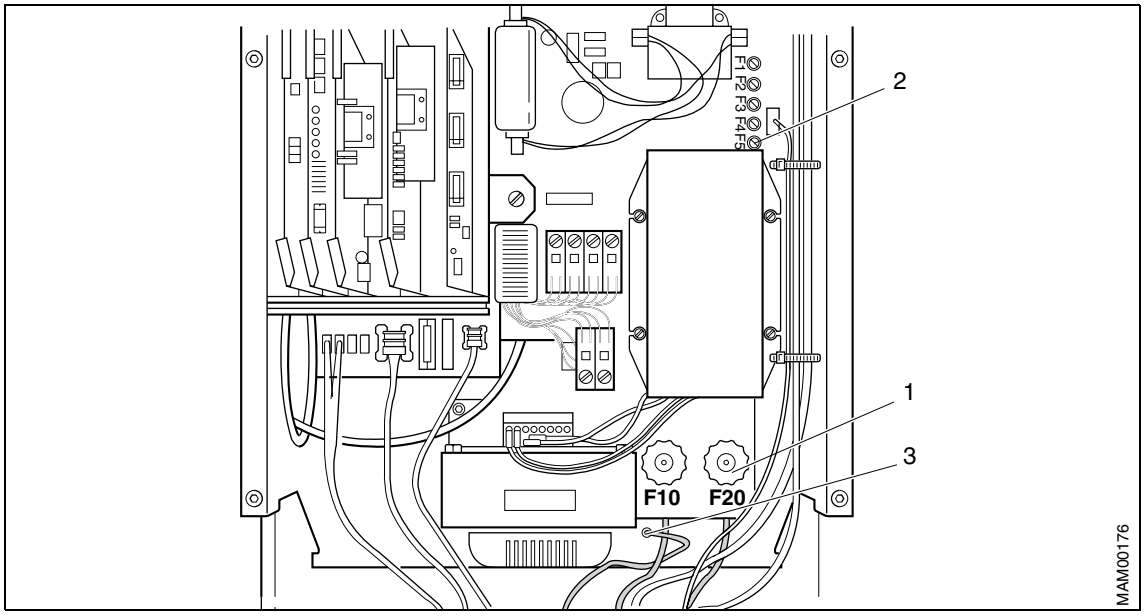

Fig. 15 Mains supply to the generator

1. Check that there is no wire jumper at F20 (1) and no brass plug at F5 (2).
   Fuses must be inserted into fuse holders F20 and F5.
2. Connect the mains supply cables between stand and generator to fuses F10 and F20 on the generator.
   Wire marked L1 to F10 and L2/N to F20.
3. Connect the protective ground wire from the stand to the generator (3).

Measures for changing from 2-phase to 1-phase connection

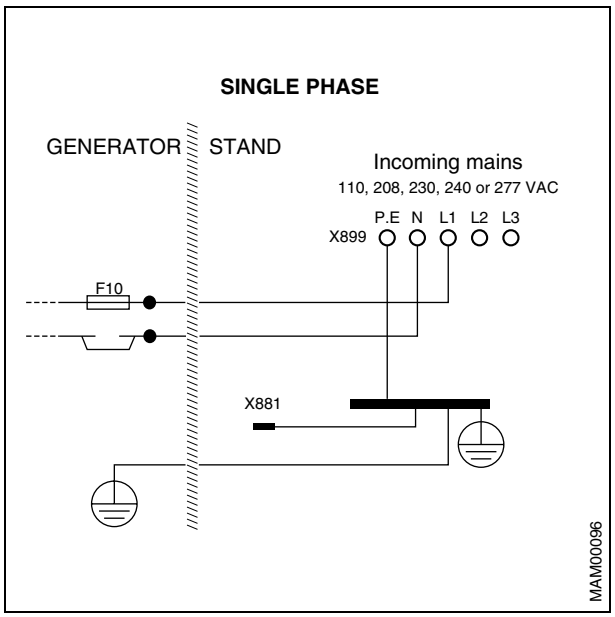

Fig. 16 Incoming mains, 1-phase

1. Move wire marked N/L2 from X899 L2 to X899 N (stand).
2. Connect incoming phase of the power supply to L1 and the neutral conductor of the power supply (0 V) to N and fuse F20.
3. Strain-relieve the incoming mains cable as shown in Fig. 13.
4. Short circuit F20 (1) and F5 (2) in Fig. 15 with the jumper and brass plug included in the service bag.

⚠CAUTION	**For single-phase mains connection, make sure that the neutral conductor of the power supply (0V) is connected to terminal N and fuse F20.**

NOTE	**Connections on transformer T10 must be adapted to the actual mains voltage, see Wiring Diagram for details.**

5. Connect the mains supply cable between stand and generator to fuses F10 and F20 on the generator. Wire marked L1 to F10 and L2/N to F20.

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Checks before powering up the generator

On P.C. board D702:

1. Set switch S1(UZW) to "OFF" (lower position).
2. Set switch S2 (SS) to "OFF" (lower position).

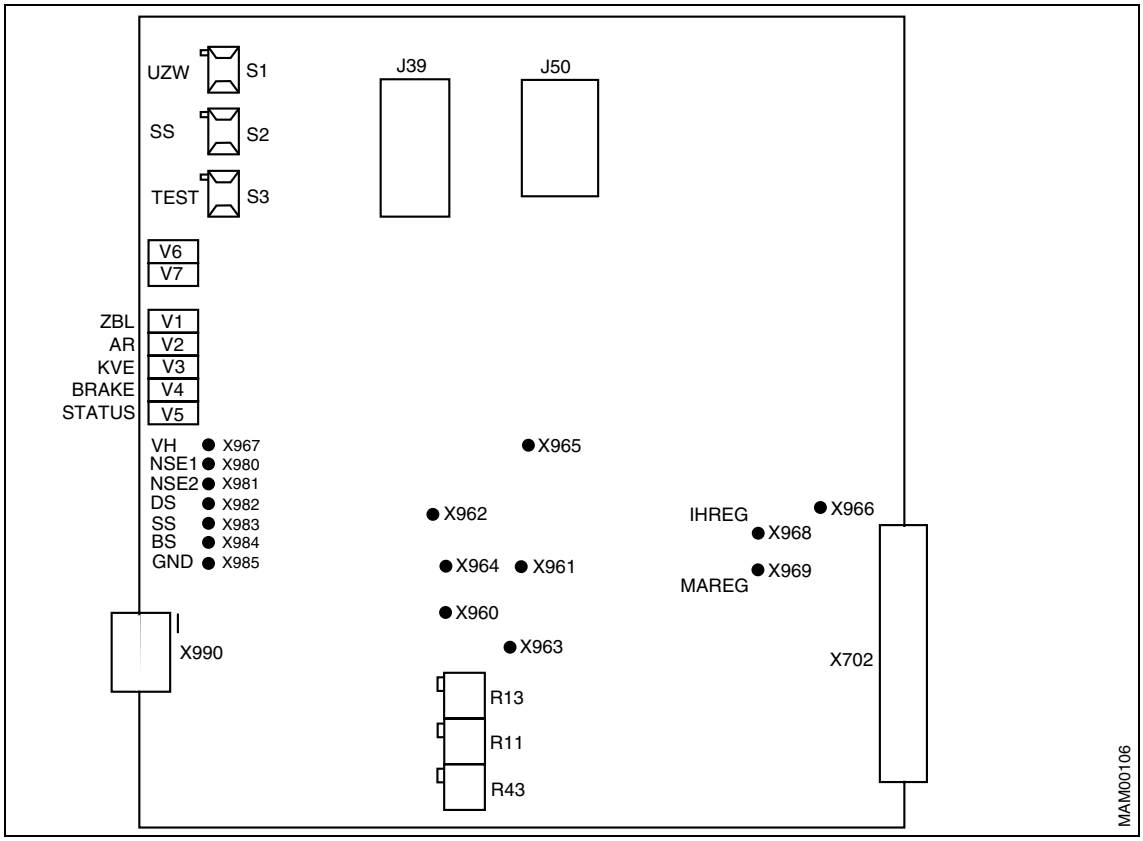

Fig. 1 P.C. board D702

Measuring the line resistance

See Fig. 2.

1. Remove fuses F10 (1) and F20 (2) or, when single-phase supply, fuse F10 (1).
2. Connect line resistance meter to fuse holders F10 and F20.
3. Mains supply "ON".
4. Carry out measurement.
5. Mains supply "OFF".

To achieve the full output, the resistance measured must not exceed the following values:

- 0.25 Ω at 110 V (1-phase)
- 0.45 Ω at 208 V
- 0.50 Ω at 230 V
- 0.60 Ω at 240 V
- 0.65 Ω at 277 V
- 0.85 Ω at 400 V (2-phase)

If the above values are exceeded, reduce the generator power in accordance to Chapter 14 "Further programming" in this manual.

Checking the line voltage in the generator

1. If not already done, remove fuses F10 (1) and F20 (2) or, when single-phase supply, fuse F10 (1).

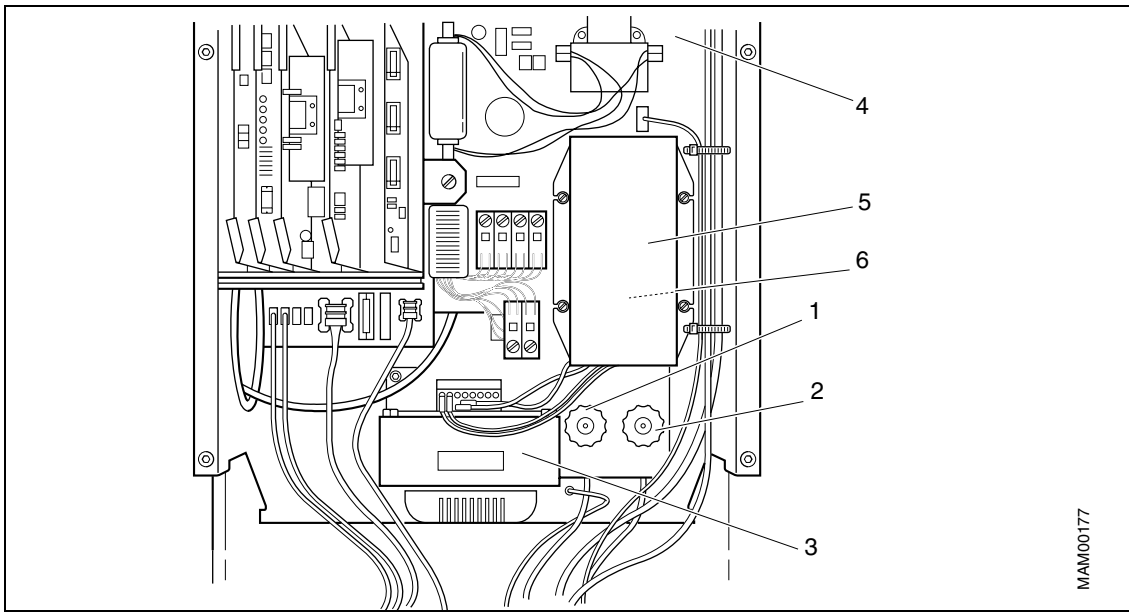

Fig. 2 Line voltage in the generator

2. Mains supply "ON".
3. Measure the voltage at fuse holders F10 (1) and F20 (2).
4. Check that the mains voltage agrees with the voltage plugged on transformer T10 (3) and P.C. board D711 (4), located above line filter Z1 (5).
5. Mains supply "OFF".
6. Reinsert fuses F10 (1) and F20 (2).
7. Mains supply "ON" **(Do not switch the system on yet)**.
8. Measure the voltage at transformer T1 (6) terminals 1 and 3, transformer T1 is located under the line filter Z1 (5). There must be 195 V- 253 V between the terminals.
9. Measure the voltage at the output of line filter Z1 it must lie within 195 V- 264 V.

Checking the supply voltages

The correct supply voltages +5 V, +15 V and +24 V have already been tested in the factory. Only a visual check of the function is therefore needed.

1. System "ON".
2. Check that the following orange diodes are "ON" on p.c. board D704:

   V39 (+15 V)

   V38 (-15 V)

   V41 (+5 V)

   V40 (+24 V)

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Attaching the swivel-arm covers

Arranging the swivel-arm system

1. Install object table, no compression force (swivel-arm system still upside down).
2. Remove the protective strips from the metal curtain.
3. Run the lifting carriage upwards.
4. Put back the protective strips onto the metal curtain.
5. Rotate the swivel-arm system to 0 degrees by pressing one of the switches for clockwise rotation on the supporting arm.
6. System and mains "OFF".
7. Remove the swivel-arm system transport safeguard, see Chapter 3 "Preparatory work".

Connecting the cables to control-button boards and patient handles

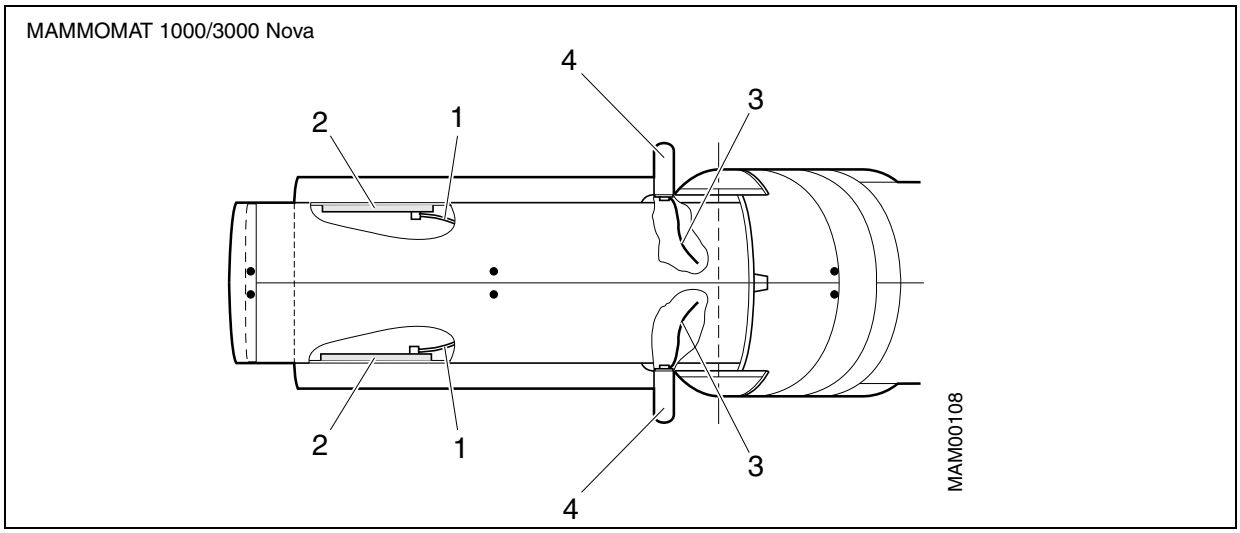


Fig. 1 Connecting the cables

Before installing the side covers, the cables are to be connected.

1. Connect cables X807 (1) to control-button circuit boards D807 (2).
2. Connect ground wires (3) to patient handles (4).

Attaching the side covers

Screws in different sizes are included in the delivery.

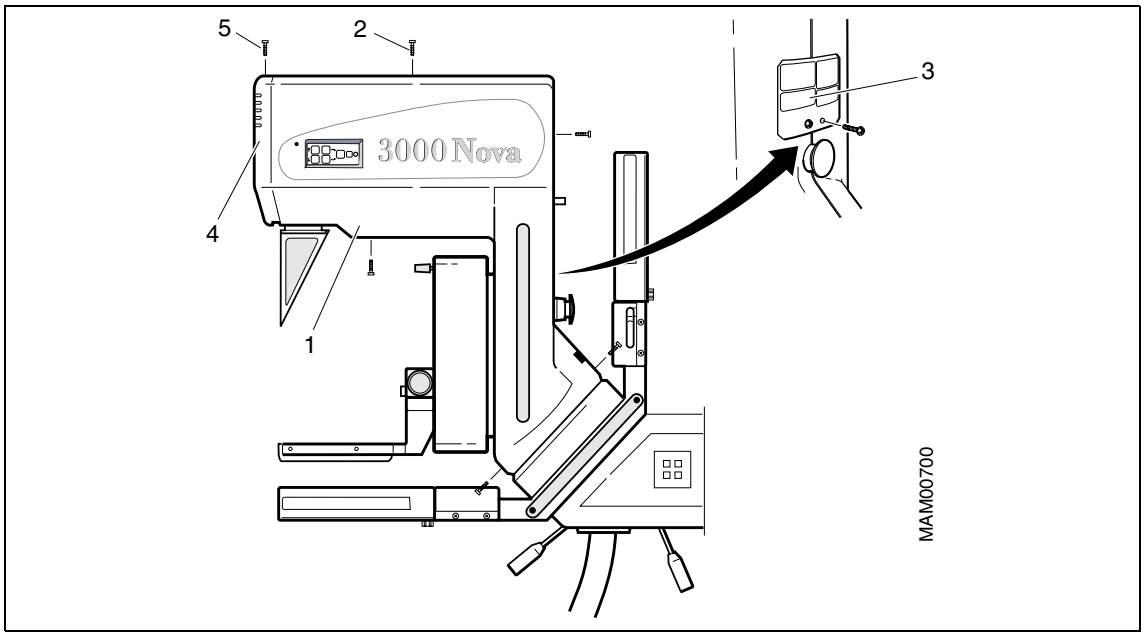


Fig. 2 Covers and sign

1. Mount the side covers (1) with six screws (2) on each side.

NOTE

Do not forget to fit the sign (3) when mounting the side covers. Use the two longer screws.

Attaching the front cover

⚠CAUTION

Risk of damages.

If the covers are exposed to internal stress cracks might arise.

The following work must be carried out with caution.

1. The side covers must be flush at the front. If necessary, loosen the screws and adjust the side covers.
2. Carefully fit the front cover (4) so that both openings engage with the lugs of the side covers.
3. Carefully swing the front cover upwards and let it snap in position over the side covers.

⚠CAUTION

The front cover must not press against the collimator.

Risk of damage.

Be careful while attaching the front cover.

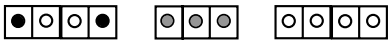
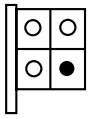
4. Fasten the front cover to the side covers with two short screws (5).

Microprocessors

The following LED displays on the processor P.C. boards indicate whether the relevant microprocessors are operating correctly.

1. Mains and system "ON".

   The following conditions must be indicated after not more than 15 s.

Microprocessors for:	LED displays
AEC: P.c. board D701	 ○ Must be off. ● Steadily on. ◉ Must be steadily on or off.
Master: P.c. board D702	 ○ Must be off. ● Flashing rapidly.

MAM00649

P.C. board D711:

- V9 "ON" (line voltage on).
- V13 "OFF" (system stand-by).
- V11 "ON" (system on).
- V16 "ON" (intermediate circuit - filament).

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Checks without high voltage

1. System "OFF".
2. On P.C. board D702 set switch S1 (UZW) to "ON" (upper position) and switch S2 (SS) to "OFF" (lower position).
3. System "ON".
4. Insert a cassette.
5. Set 27 kV and maximum mAs on the control panel.

NOTE	**The cassette must be removed and reinserted after each exposure to allow for the next exposure release. This is to avoid double exposures.**

6. Press the exposure buttons on the control panel. The rotating anode shall start up. At the end of the time limit, the rotating anode is braked.
7. Release the exposure buttons.
8. System "OFF".

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Preparation

This section describes how to check:

- High voltage.
- Tube current.
- mAs values.

NOTE	**Check that the high-voltage plug is plugged into H1 and properly secured.**

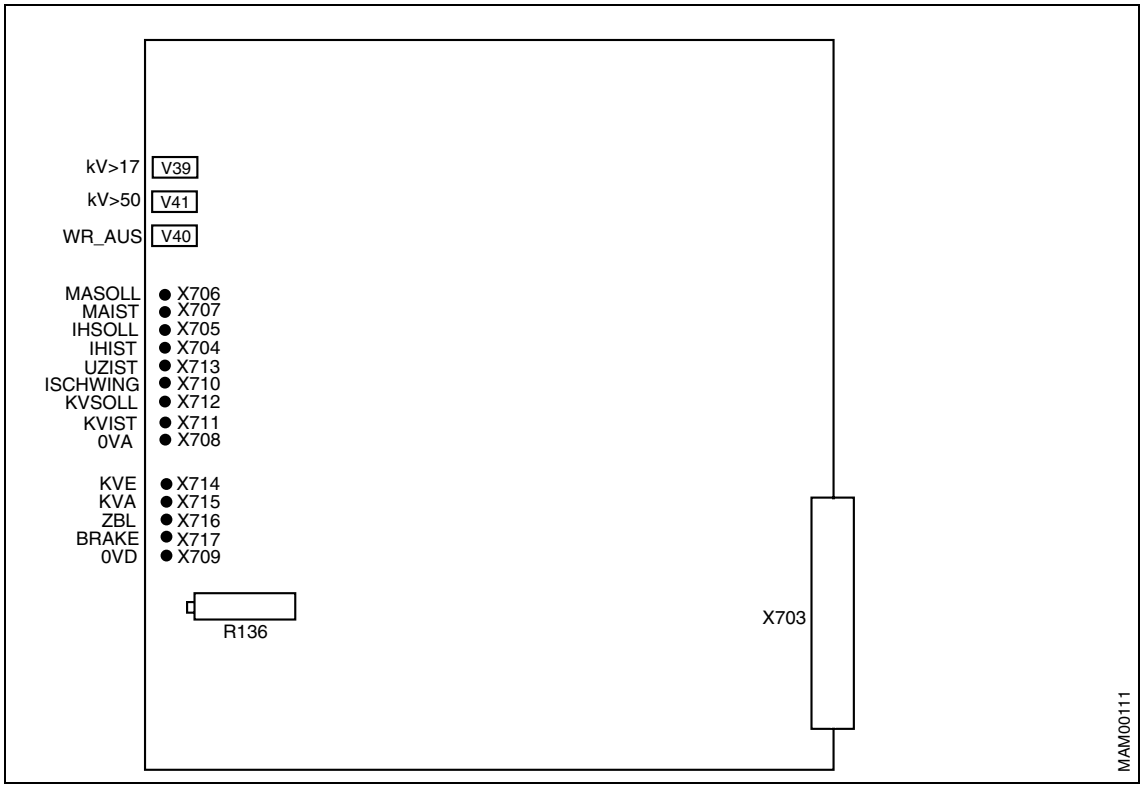


Fig. 1 P.C. board D705

1. Set switch S2 (SS) to "ON" (upper position) on P.C. board D702.
2. Remove the jumper and connect the mAs meter to mAs measuring sockets X3 and X4 on P.C. board D710.

3. Connect oscilloscope to P.C. board D705 as follows:
   - Channel 1 to measuring point "KVIST (actual value)" (1 V= 5 kV).
   - Channel 2 to measuring point "MAIST (actual value)" (1 V= 40 mA).
   - Trigger at measuring point "KVE" (start with high voltage "ON"), rising edge.
   - Twist the measuring leads and connect their grounding braids to measuring point "0 VA".
4. Connect service PC to circuit board D702 using the connection cable.
5. Start the Service Program, see Chapter 22 "Appendix".
6. Check the anode menu for correct selection (tungsten anode enabled or disabled, depending on which type of X-ray tube the customer has chosen). See Service Program Instructions SPB7-230.114.03. ... .

NOTE **It is possible to select tungsten anode, even if the customer does not have this option. However, the 50 µm Rh filter will then be missing.**

kV-adjustment

Check the kV as follows:

1. Mains voltage and system OFF.

⚠WARNING **After shut-down of the system, there may still be 380 V DC present on the intermediate circuit.**

Life-threatening electric shock hazard exists.

The voltage level will be indicated by LED V24 on PC board D710. The voltage will drop to less than 30 V within about 3 minutes, the LED goes out at about 30 V.

2. Connect DVM between the lower ends of R72 and R73 (on the left side of the high tension plug) on D710 circuit board.
3. Mains voltage and system ON.
4. Set 27 kV and maximum mAs on the control panel.
5. Make an exposure and check that the DVM shows ±2.700 V ±0.010 V. Note the values in the kV-adjustment protocol on page 22 - 6.

6. If necessary, adjust R43 on D702 (Fig. 2) and make another exposure. Note the new values in the kV-adjustment protocol.

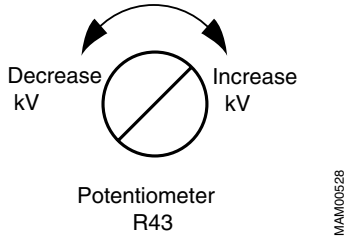


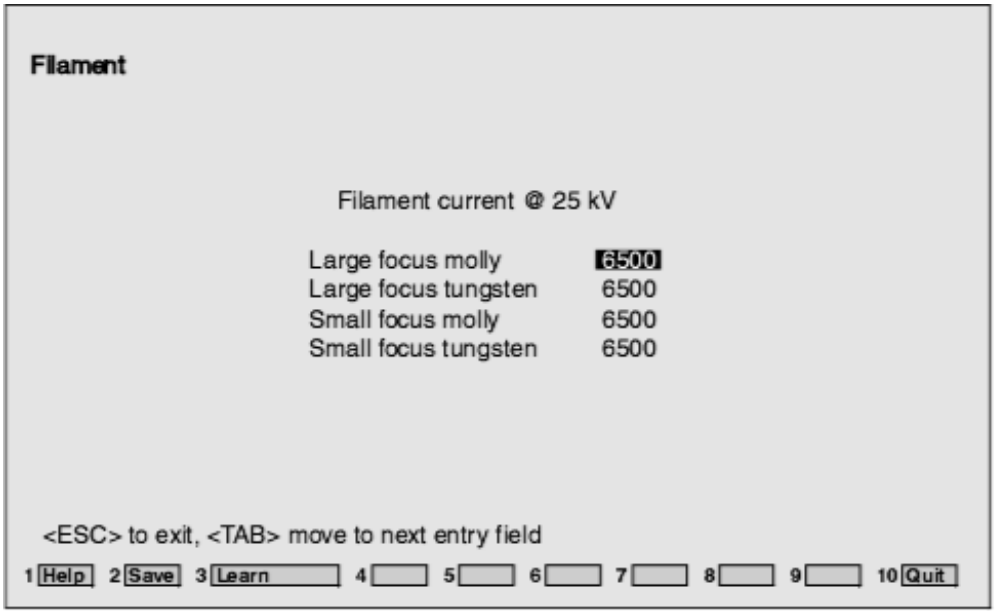
Fig. 2

NOTE	**Do not overload the X-ray tube by making too many exposures in a short time.** **R43 does not need to be relocked with locking paint.**

7. Mains and system OFF.
8. Disconnect DVM from R72 and R73.

Filament

1. In <Mainmenu> select <Configuration> and <Filament>.


Filament
Filament current @ 25 kV
Large focus molly 6500
Large focus tungsten 6500
Small focus molly 6500
Small focus tungsten 6500
<ESC> to exit, <TAB> move to next entry field
1 Help 2 Save 3 Learn 4 5 6 7 8 9 10 Quit
MAM00657

2. Perform Learn filament for available options.
3. Note the new values in the Test protocol (Filament).

NOTE	**Only settings for Mo available for M1000.**

Checking X-ray tube high voltage, tube current and mAs values

1. System "ON".
2. Set the "cassette loaded" switch to "OFF" with the Service Program:
   Configuration - **Miscellaneous** - **Cassette loaded check**.
3. Trigger test exposures with the following exposure values and check the kV values and tube current characteristic on the oscilloscope (see oscillograms).
   The accuracy of the kV is ±5% plus ±1.5 kV during the first 5 ms of the exposure.
   For mA values < 50 mA, the accuracy of the kV is ±5% plus ±2 kV during the first 5 ms.
   The tube current must rise quickly to the set value at the beginning of the exposure and run linearly during the exposure.
   The accuracy of the mAs product must be ±10%.
4. Replace the jumper previously removed from sockets X3 and X4 on P.C. board D710.

Oscilloscope diagrams

- MAMMOMAT in mAs mode, see Fig. 3 - Fig. 10.

NOTE

Checks indicated by * shall be disregarded in installations with filter disc Mo 0.03 / Rh 0.025 (molybdenum rotating anode).

Tube P40 MoW,
MAMMOMAT 3000 Nova
*** tungsten anode 0.3**

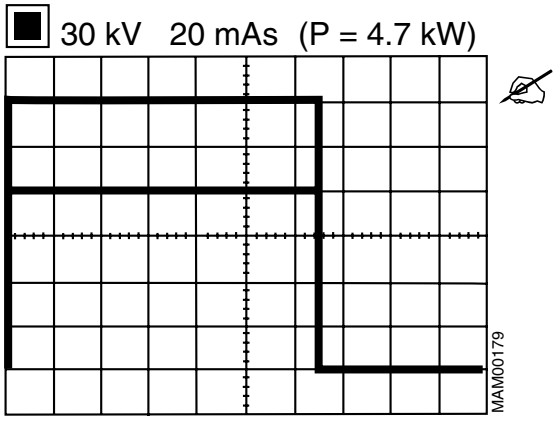


Fig. 3

30 kV	1 V/T (1 T <=> 5 kV)
158 mA	1 V/T (1 T <=> 40 mA)
127 ms	20 ms/T

Tube P40 MoW,
MAMMOMAT 1000/3000 Nova
molybdenum anode 0.3

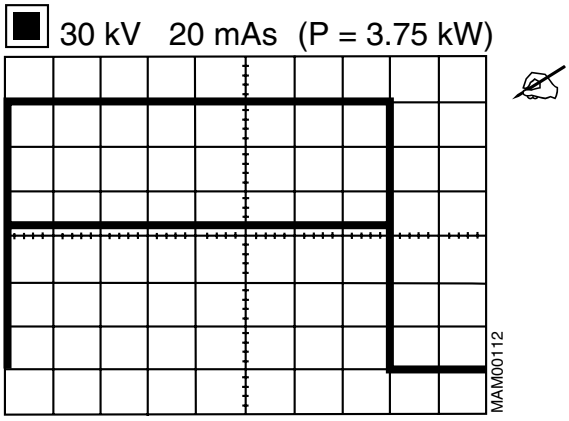


Fig. 4

30 kV	1 V/T (1 T <=> 5 kV)
125 mA	1 V/T (1 T <=> 40 mA)
160 ms	20 ms/T

NOTE

Record the measured kV and mAs value in the Test protocol, page 22 - 10.

Tube P40 MoW,
MAMMOMAT 3000 Nova
*** tungsten anode 0.3**

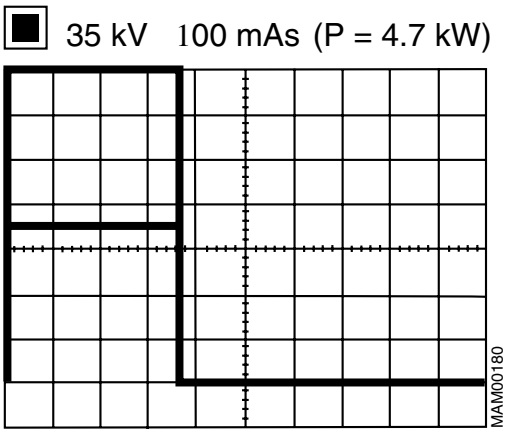


Fig. 5

35 kV	1 V/T (1 T <=> 5 kV)
134 mA	1 V/T (1 T <=> 40 mA)
0.75 s	0.2 s/T

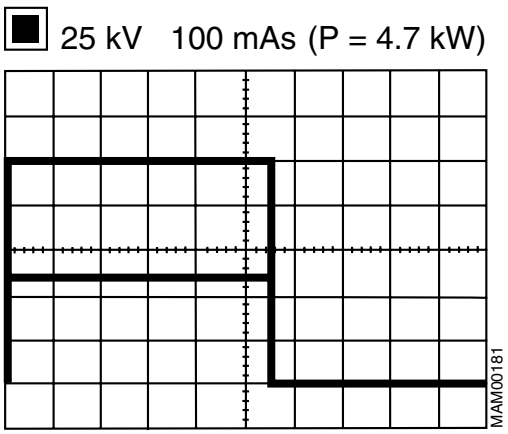


Fig. 7

25 kV	1 V/T (1 T <=>5 kV)
188 mA	2 V/T (1 T <=> 80 mA)
0.53 s	0.1 s/T

Tube P40 MoW,
MAMMOMAT 1000/3000 Nova
molybdenum anode 0.3

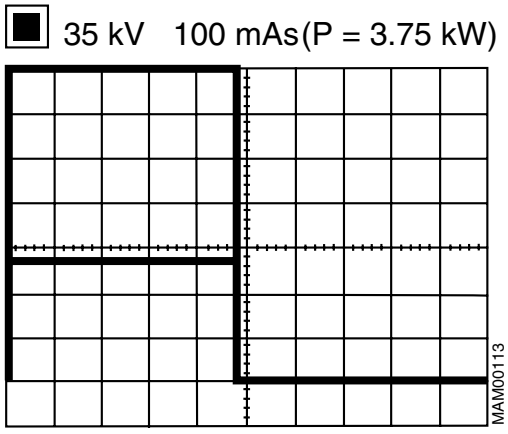


Fig. 6

35 kV	1 V/T (1 T <=> 5 kV)
107 mA	1 V/T (1 T <=> 40 mA)
0.93 s	0.2 s/T

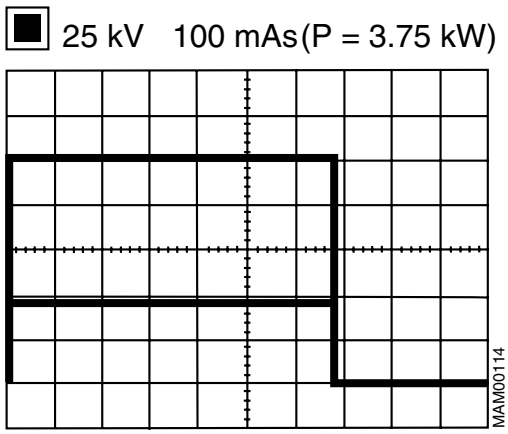


Fig. 8

25 kV	1 V/T (1 T <=> 5 kV)
150 mA	2 V/T (1 T <=> 80 mA)
0.67 s	0.1 s/T

Tube P40 MoW,
MAMMOMAT 3000 Nova
*** tungsten anode 0.15**

30 kV 10 mAs (P = 0.85 kW)

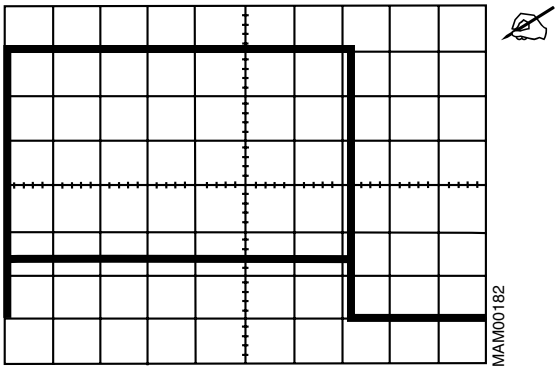


Fig. 9

30 kV	1 V/T (1 T <=> 5 kV)
28 mA	0.5 V/T (1 T = 20 mA)
360 ms	50 ms/T

Tube P40 MoW,
MAMMOMAT 1000/3000 Nova
molybdenum anode 0.15

30 kV 10 mAs (P = 0.70 kW)

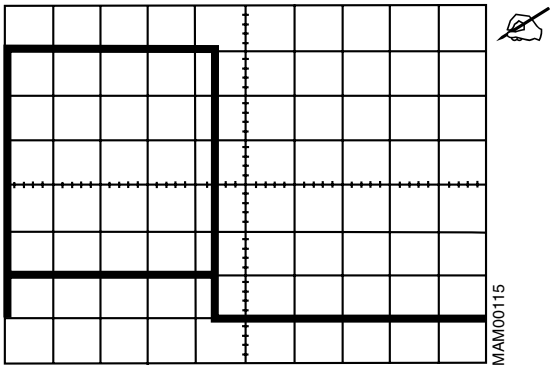


Fig. 10

30 kV	1 V/T (1 T <=> 5 kV)
23 mA	0.5 V/T (1 T <=> 20 mA)
430 ms	100 ms/T

NOTE	**Small focus is selected by attaching a magnification table.**
NOTE	**Record the measured kV and mAs value in the test protocol, page 22 - 10.**

NOTE **Measurements in AEC mode shall be performed after calibrating and adjusting the AEC.**

Tube P40 MoW,
MAMMOMAT 3000 Nova
*** tungsten anode 0.3**

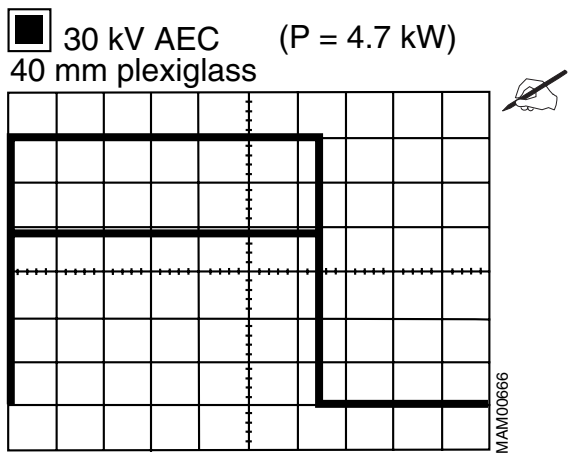


Fig. 11

30 kV	1 V/T (1 T <=> 5 kV)
158 mA	1 V/T (1 T <=> 40 mA)
*)	100 ms/T)

Tube P40 MoW,
MAMMOMAT 1000/3000 Nova
molybdenum anode 0.3

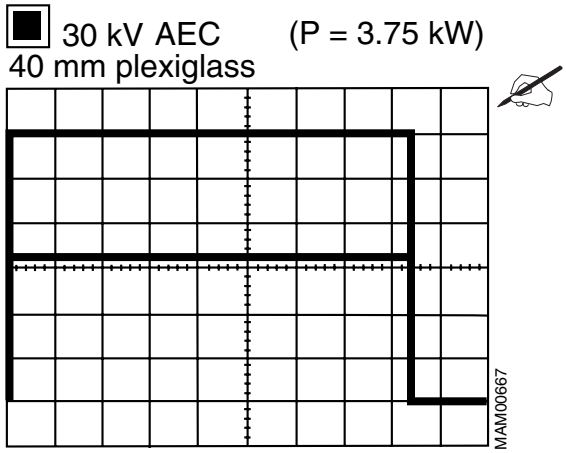


Fig. 12

30 kV	1 V/T (1 T <=> 5 kV)
125 mA	1 V/T (1 T <=> 40 A)
*)	100 ms/T

*) total exposure time dependent on programmed sensitivity

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NOTE

Check that all object tables do not have AEC grids.
If they have AEC grids remove the grid bars according to "Installation Instructions object tables" RXB7-120.031.06..., which is delivered with each object table.

Checking and programming with the service PC

Use the service PC to check and program the AEC.
Operation of the service PC is described in Chapter 22 "Appendix".

The AEC is based on correction tables. The tables are optimized for the following film/ screen combinations.

The tolerances of the AEC are specified for incremental gamma ⩽ 5.

Table 1

				Correction table identifications		
Film	**Screen**	**Cassette**	**Sensitivity**	**Mo/Mo**	**Mo/Rh**	**W/Rh**
Kodak Min-R 2000	Kodak Min-R 2000	Kodak Min-R 2	0	1004	1005	1006
Kodak Min-R 2000	Kodak 2190	Kodak Min-R 2	0	1004	1005	1006
Kodak Min-R EV	Kodak EV 150	Kodak Min-R 2	0	1004	1005	1006
Kodak Min-R EV	Kodak EV 190	Kodak Min-R 2	0	1004	1005	1006
Kodak Min-R EV	Kodak EV 250	Kodak Min-R 2	0	1004	1005	1006
AGFA HDR	AGFA HD S	AGFA Mammoray	0	1004	1005	1006
AGFA HDR C	AGFA HD S	AGFA Mammoray	0	1004	1005	1006
AGFA HDR C Plus	AGFA HD S	AGFA Mammoray	0	1004	1005	1006
Fuji AD-M	Fuji AD Medium	Fuji AD-MA	0	1201	1202	1203
Fuji AD-M	Fuji AD Mammo Fine	Fuji AD-MA	0	1004	1005	1006
Fuji UM-MA HC	Fuji UM Mammo Medium	Fuji AD-MA	0	1104	1105	1106
Fuji UM-MA HC	Fuji UM Mammo Fine	Fuji AD-MA	0	1104	1105	1106

For Sterling, the correction table for Kodak Min-R 2000 is recommended.

The indications of this table are meant as recommendations. In case of failure the calibration of AEC with other series of correction tables may be attempted.

NOTE

If the film/screen combination in question is not listed in Table 1, the correction tables for one of the listed combinations will have to be used, although the tolerances for OD variation then cannot be guaranteed.
Primarily, use the correction tables for Kodak Min-R 2000 if the film/screen in question is a Kodak etc.

Preparation of backup floppy

1. On the service PC choose DOS prompt. Create the new directory AEC_inst:
   C:\>mkdir AEC_inst
2. Change the working directory to the above:
   C:\>cd AEC_inst
3. Copy the service PC floppy to C:
   C:\AEC_inst> copy a:*.*
4. Copy the floppy AEC correction tables to C:
   C:\AEC_inst> copy a:*.*
5. Mark the empty backup floppy with version of service program and insert in drive A.
6. Copy the contents of AEC_inst to A:
   C:\AEC_inst> copy *.* a:

Use this floppy for the remainder of the installation.

Offset compensation

NOTE	**Make sure that the "cassette loaded" switch is in position "OFF".**

MAMMOMAT equipped *with* tungsten anode and:

- One wing: three exposures each are to be made with Mo/Mo and W/Rh set
- Two wings: three exposures with Mo/Mo set on Wing 1 and three exposures with W/Rh set on Wing 2

MAMMOMAT *without* tungsten anode and *with*:

- One wing: three exposures with Mo/Mo
- Two wings: three exposures with Mo/Mo set on Wing 1 and three exposures with Mo/Mo set on Wing 2

1. Make sure the backup floppy is inserted (not write protected).
2. Use an object table with grid.
3. Place a metal plate (part no. 65 52 728) in the cassette opening of the object table, covering the AEC detector.
4. Place the detector in chestwall position.
5. In <Mainmenu> select <Service> and <Offset compensation test>.

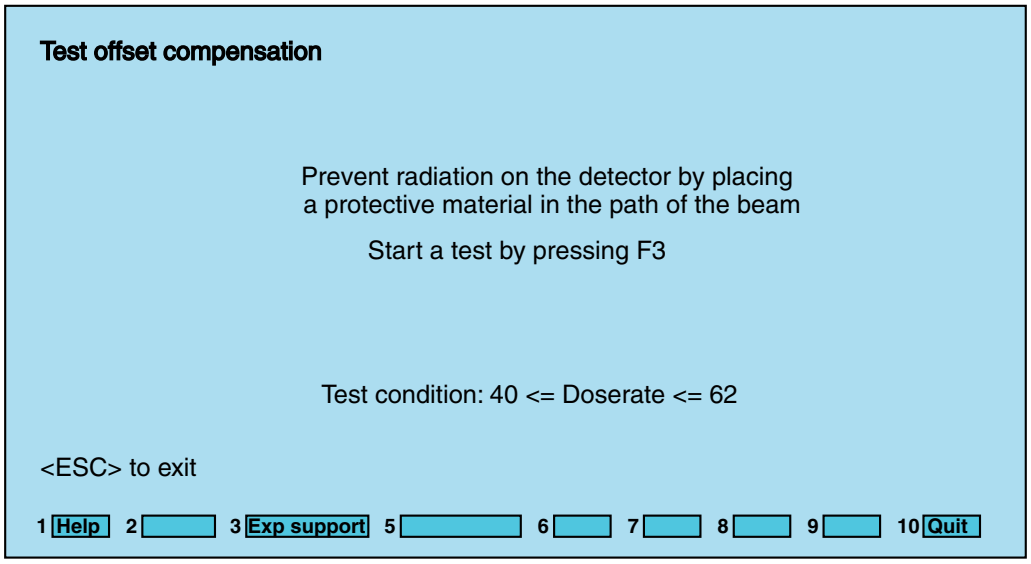
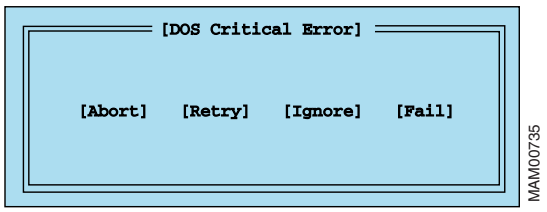


Fig. 1 Service Program menu, *Test offset compensation* dialog

Error message
If the menu "Dos critical error" would appear during the installation, always press "F" (for fail) and check that the correct floppy is inserted, and is not write protected.



6. Press <F3> and follow the instructions in the dialogs for exposure.

NOTICE

If Er 02X occurs:

Exit the offset compensation test in the Service Program by pressing Esc. Acknowledge the error by pressing the limit button. Wait until the green lamp on the control panel is lit. In <Mainmenu> select <Service> and <Offset compensation test> and continue the test.

NOTE

Make sure that the correct anode/filter combination and wing are selected, according to the list of alternatives at the top of this page.

7. The measured dose rate will be displayed on the screen. If the result is OK go on with step 8. If not OK, check that the detector is not mechanically grounded and repeat the test.
8. Make two more exposures with the same Anode/Filter combination, by repeating steps 6 and 7.
9. Repeat steps 6 to 8 until all exposure alternatives, as listed above, are covered.
10. Remove metal plate (part no. 65 52 728).
11. Exit the offset compensation test in service PC by pressing Esc.

Configuration of the AEC

Definitions

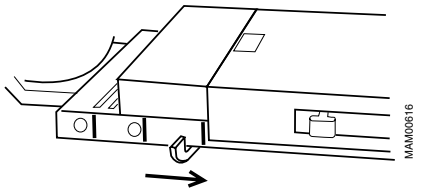
Object table group

An object table group contains all object tables of the same type. There are four groups of object tables - Grid, No grid, Magnification and Stereo. For example the object table group Grid, consists of Grid 18x24 and Grid 24x30.

General conditions

When performing the settings in this chapter, there are some general conditions valid for all settings:

- The detector is to be in chestwall position.



- The AEC calibration plexi must extend at least 10 mm beyond the chestwall edge of the table and be centered, see Fig. 2, Page 11 - 8. Place the AEC calibration plexi in the same position for all exposures.

Calibration conditions

Compression plate must not be used during the calibration of correction tables. From the point sensitivity correction (fine setting) and further on, a compression plate may be used.

Reference cassette

Every MAMMOMAT should have a reference cassette. Use this reference cassette where required and for the settings in this chapter. If there is no dedicated reference cassette, pick one cassette, mark it and use it for the settings in this chapter.

Film

When calibrating the wings and the correction tables, it is possible to use the same film for each exposure. However, when setting the sensitivity, the operator needs to check the optical density and the film must be exchanged and developed between every exposure.

Mains voltage

Unless otherwise stated, the mains voltage and system must be ON and the service PC program running, before performing any setting in this chapter.

Sensitivity conditions

- One step (1/8 E.P.) corresponds to approximately 0.06 O.D. with an incremental gamma of 5.
- Measure the optical density on the emulsion side of the film.

Correction of the measured Optical Density (O.D.)

Due to variations in the developing conditions (see also section "Normal developing conditions") the measured optical density of one specific image might not correspond to the adjusted optical density (sensitivity setting). Therefore the optical density has to be corrected for the variations in the developing conditions.

NOTE	**This correction has to be made for** **1. fine setting of sensitivity correction** **2. setting of sensitivity** **3. final testing.**

OD_m	The measured optical density in the measuring point, see Fig. 2.
OD_{corr}	The corrected optical density.
OD_{strip}	The O.D. in the step of the sensitometer strip *closest* to the O.D. of the measuring point.
OD_{strip_ref}	The measured OD_{strip} on first film exposed under normal developing conditions shall be used as OD_{strip_ref}.

Procedure

- - For grid/no grid: cover the area far from the chestwall side with metal plate (part no. 65 52 728).
  - For magnification: place metal plate (part no. 65 61 026) *inside* the magnification table as close as possible to the cassette to prevent scattered radiation and cover the area far from the chestwall side.
- Develop all films with a sensitometer strip on the part that was covered by the metal plate (part no. 65 52 728 or 65 61 062).
- Measure the optical density in two places: OD_m (as described in Fig. 2) and OD_{strip} (on the sensitometer strip).
- Calculate the corrected O.D. as follows:

$OD_{corr} = OD_m + (OD_{strip\_ref} - OD_{strip})$

Normal developing conditions

When measuring the O.D., it is essential that the working conditions are as close to normal as possible. There are several parameters that may effect the results:

- Temperature of developer and dryer
- Feeding and developing speed
- Replenishing speed of developer and fixer (liquids)

If possible, develop the film among other films when the developer is warm and stabilized.

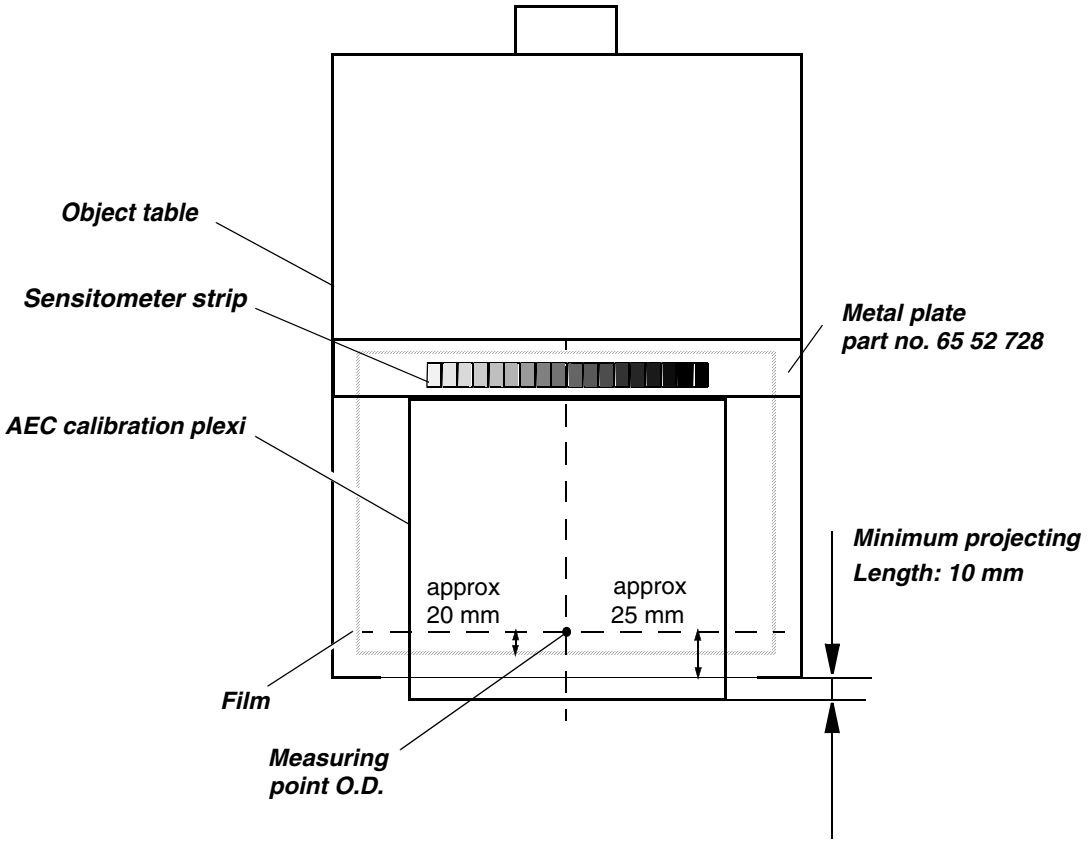


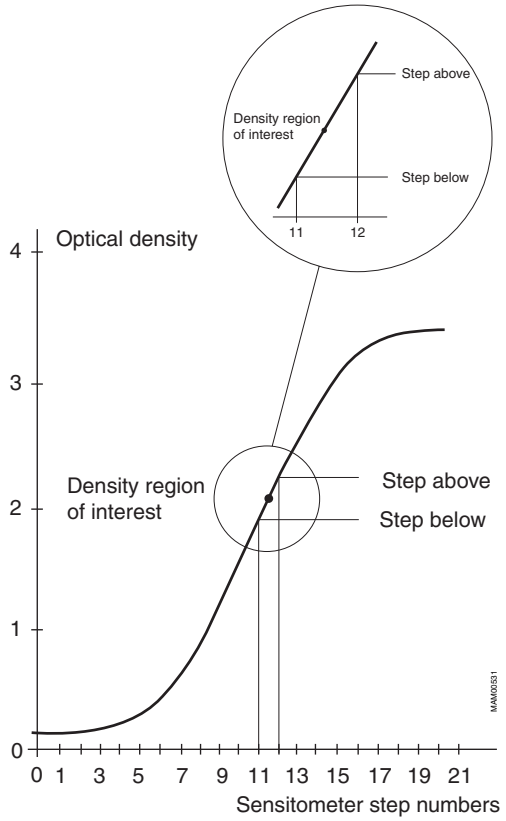
Fig. 2 Position of AEC calibration plexi and film

*Applicable on condition that the detector is placed in chest-wall position.

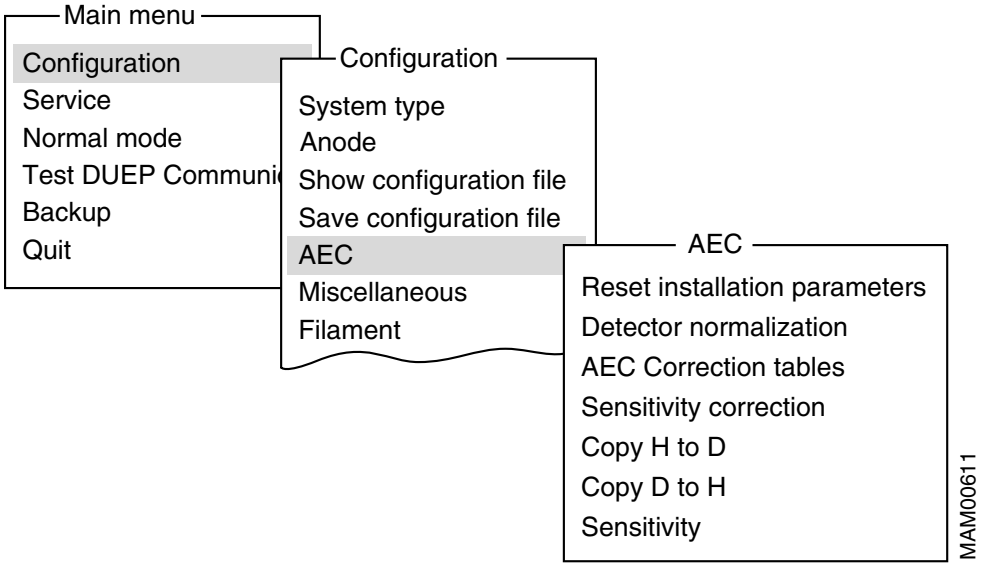
Incremental gamma

Incremental gamma is defined as the slope of the gamma curve in the density region of interest.

On the sensitometer strip it means that:
Incremental gamma = (blackening on the step closest above density region of interest - blackening on the step closest below that step) / 0.15.



Overview of work routine



1. "AEC Correction tables" on Page 11 - 11.
2. "Sensitivity correction (fine setting)" on Page 11 - 20.
3. "Sensitivity" on Page 11 - 21.
4. "Copy H to D" on Page 11 - 22.

AEC Correction tables

This section will guide you through the following steps:

- Installation of correction tables (F2).
- Calibration of correction tables (F3), including rough setting of sensitivity correction.

The AEC uses one correction table for each Anode/Filter/Speed combination.
Each correction table has separate corrections for each object table group (Magnification, Grid, No grid and Stereo).

NOTICE

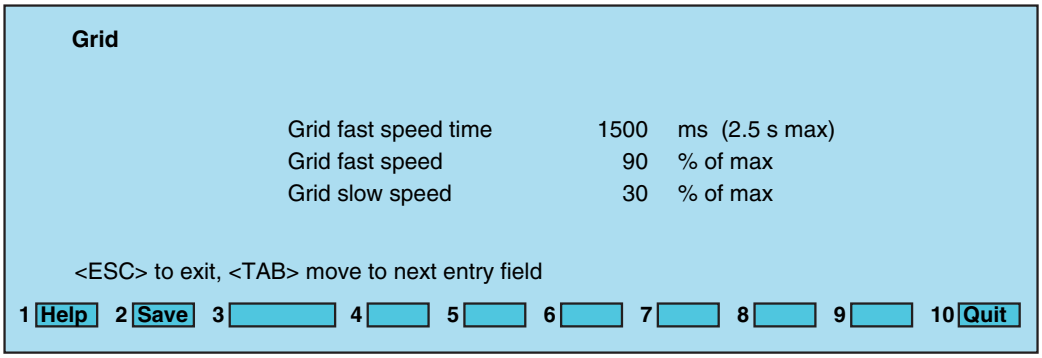
For exact positioning of the needle, the anode/filter combination "Mo/Mo" or "Mo/Rh" must be used. Therefore, calibration does not have to be attempted for W/Rh combination in stereo mode.

DLF switch off

Deactivate the DLF switch. In <Main menu> select <Configuration>, <Miscellaneous> and <DLF switch>, press space to set switch to OFF. Press <F2> to save.

Increase grid speed

Increase the grid speed. In <Main menu> select <Configuration> and <Grid speed>.
Set the following values:


Grid
Grid fast speed time 1500 ms (2.5 s max)
Grid fast speed 90 % of max
Grid slow speed 30 % of max
<ESC> to exit, <TAB> move to next entry field
1 Help 2 Save 3 4 5 6 7 8 9 10 Quit
MAM00761

Installation of AEC correction tables

1. In <Mainmenu> select <Configuration>, <AEC> and <AEC correction tables>. The dashes in the ID column show that no correction table is installed (Fig. 3).

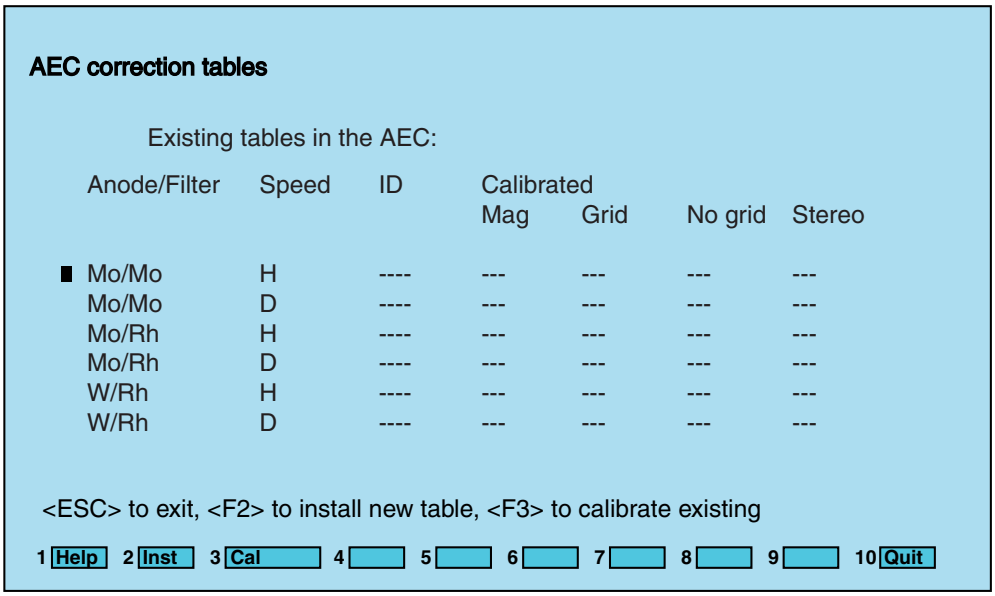
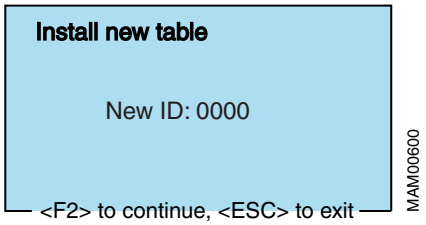

AEC correction tables
Existing tables in the AEC:
Anode/Filter Speed ID Calibrated Mag Grid No grid Stereo
Mo/Mo H ---- --- --- --- ---
Mo/Mo D ---- --- --- --- ---
Mo/Rh H ---- --- --- --- ---
Mo/Rh D ---- --- --- --- ---
W/Rh H ---- --- --- --- ---
W/Rh D ---- --- --- --- ---
<ESC> to exit, <F2> to install new table, <F3> to calibrate existing
1 Help 2 Inst 3 Cal 4 5 6 7 8 9 10 Quit
MAM00599

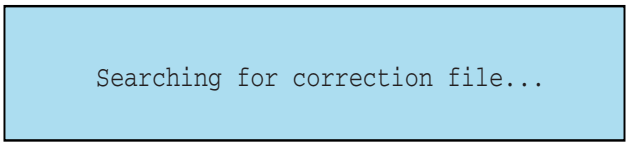
Fig. 3 AEC correction tables

NOTE **If only one film/screen combination is to be used install correction tables for H only.**

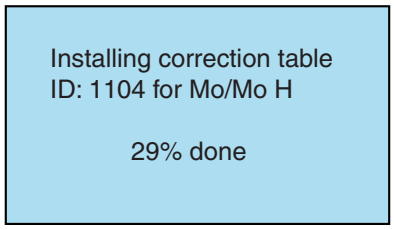
2. Make sure the backup floppy is inserted.
3. Decide for which combination you need to install correction table. (For available identifications for correction tables, see Table 1 on Page 11-1 or the backup floppy.)
4. Place the cursor by one of the desired Anode/Filter/Speed combinations. Press <F2>.



5. Type the ID number of the new correction table (see Table 1 on Page 11-1) in the dialog which appears. Press <F2> to install the table. A message box will appear before the correction file has been found.



MAM00736



MAM00729

6. When the transaction of tables is finished, a dialog like Fig. 4, Page 11 - 15 will appear. To complete the calibration, proceed from step 5 of that section.

NOTICE

In order to resume calibrating after having quit the program:

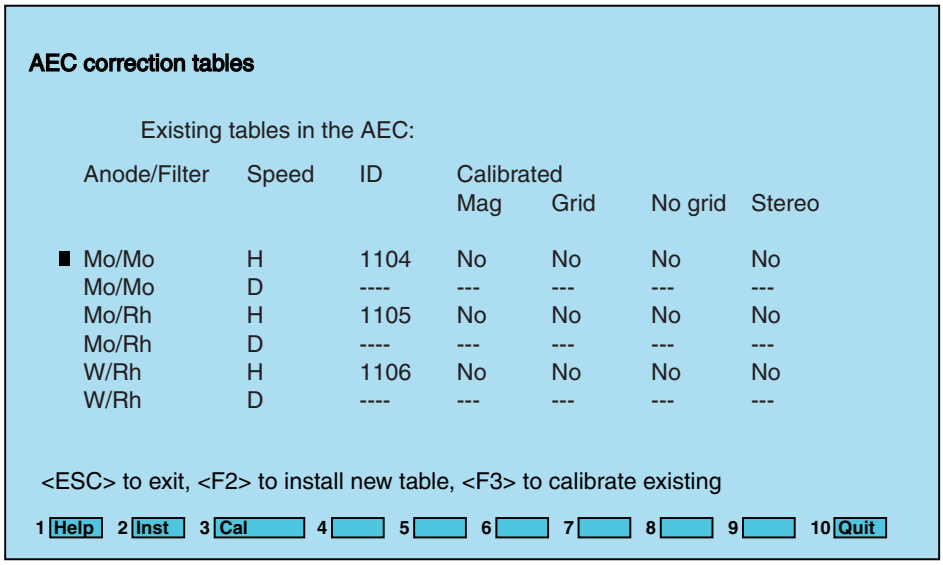
Follow the instructions from step number 1 under "Calibrate correction tables" on Page 11 - 14.

Calibrate correction tables

NOTE	**Make sure the backup floppy is inserted.**

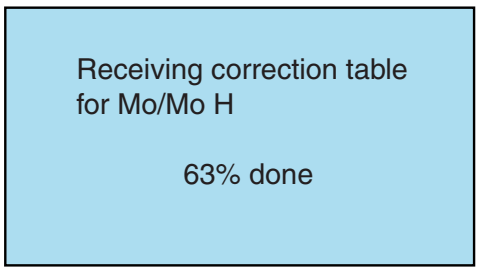
The Anode/Filter/Speed combinations should be calibrated one at a time.

1. In <Mainmenu> select <Configuration>, <AEC> and <AEC correction tables>.


AEC correction tables
Existing tables in the AEC:
Anode/Filter Speed ID Calibrated Mag Grid No grid Stereo
■ Mo/Mo H 1104 No No No No
Mo/Mo D ---- --- --- --- ---
Mo/Rh H 1105 No No No No
Mo/Rh D ---- --- --- --- ---
W/Rh H 1106 No No No No
W/Rh D ---- --- --- --- ---
<ESC> to exit, <F2> to install new table, <F3> to calibrate existing
1 Help 2 Inst 3 Cal 4 5 6 7 8 9 10 Quit
MAM00730

NOTICE	**The dose monitoring function is only enabled if the applicable combination is calibrated.** **All object table groups and Anode/Filter combinations available at the site must be calibrated prior to release for clinical use. However, calibration does not have to be attempted for W/Rh combination in stereo mode.**

2. Place the marker by one of the desired Anode/Filter/Speed combinations. Press <F3> to transfer the table.
3. This message box is displayed while the service PC receives the correction table.



MAM00602

4. When the transfer is done, the dialog *Calibration AEC correction table* appears.

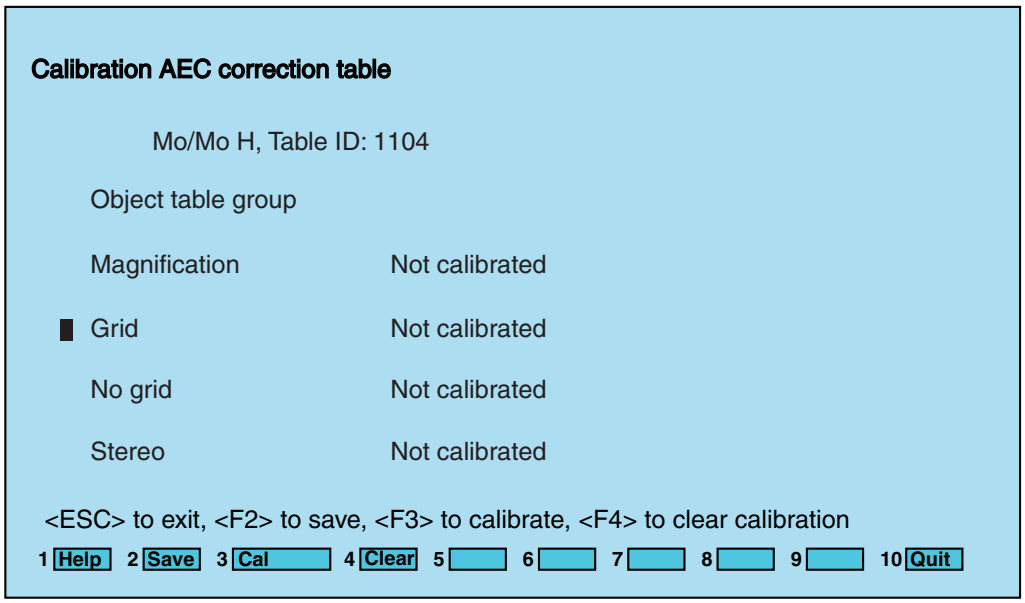
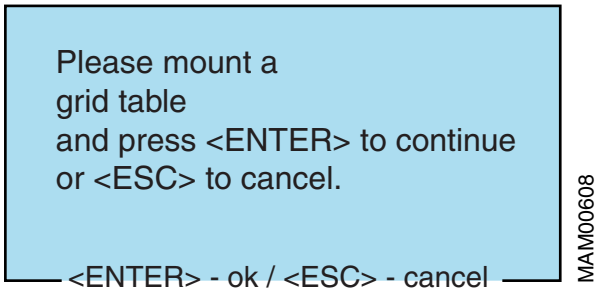

Calibration AEC correction table
Mo/Mo H, Table ID: 1104
Object table group
Magnification Not calibrated
Grid Not calibrated
No grid Not calibrated
Stereo Not calibrated
<ESC> to exit, <F2> to save, <F3> to calibrate, <F4> to clear calibration
1 Help 2 Save 3 Cal 4 Clear 5 6 7 8 9 10 Quit
MAM00731

Fig. 4 Dialog *Calibration AEC correction table* shows which object tables, in the current Anode/Filter/Speed

5. To calibrate the correction table for an object table group, place the cursor in front of the group. Press <F3>.



NOTE **Calibration of correction tables for Stereo is to be done with Stereo angle 0° and with cassette in one of the end positions of the object table.**

6. Follow the instructions in the message box above and press <ENTER>.

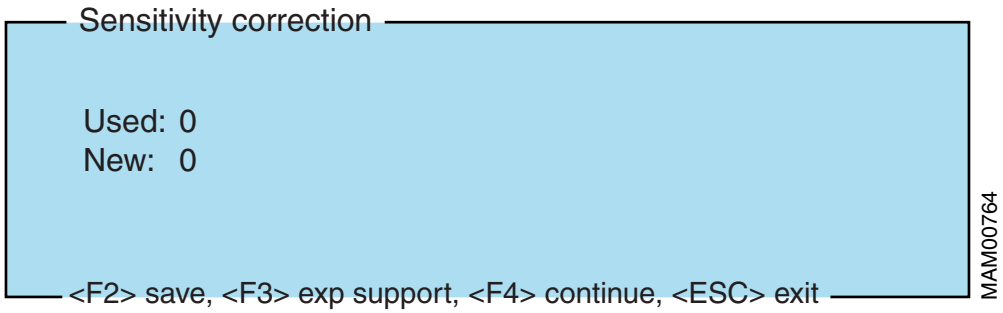


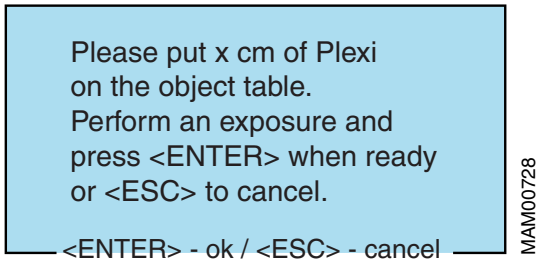
Fig. 5 Dialog *Sensitivity correction*

7. Before calibrating the installed correction tables, it is necessary to make a rough setting of the sensitivity correction for the chosen object table group. Insert the reference cassette, with a new film, in the object table.
8.

NOTE	**Make sure the backup floppy is inserted.**

NOTE	**Do not use a compression plate.**

Press <F3>.



9. Follow the instructions in the message box for performing an exposure.
10. Remove the exposed film, make a sensitometer strip and develop the film.
11. Measure O.D. in the measuring point (Fig. 2, Page 11 - 8) as well as OD_{strip} on the sensitometer strip (OD_m and OD_{strip}).
    If it is the very first exposed film, use OD_{strip} as OD_{strip_ref}.
    Correct the value according to "Correction of the measured Optical Density (O.D.)" on Page 11 - 7.
12. If the value differs from **1.5 O.D.** adjust the values in dialog *AEC - Sensitivity correction* (Fig. 5), save the new Sensitivity correction value with <F2> and repeat the procedures described from step 7.
    If the value is satisfactory, proceed by pressing <F4>.

NOTE	**One adjustment step of sensitivity correction (1/8 E.P.) corresponds to approximately 0.06 O.D. with an incremental gamma of 5.**

NOTE	**It is important to use 1.5 O.D. and the specified AEC calibration plexi during the procedures under "Calibrate correction tables", since measurements are relative to factory results at 1.5 O.D.** **The O.D. preferred by the customer can be adjusted later either in Sensitivity correction or Sensitivity.**

13. Load the cassette with film. Since it will not be developed, the same film can be used for all exposures during the following calibration.

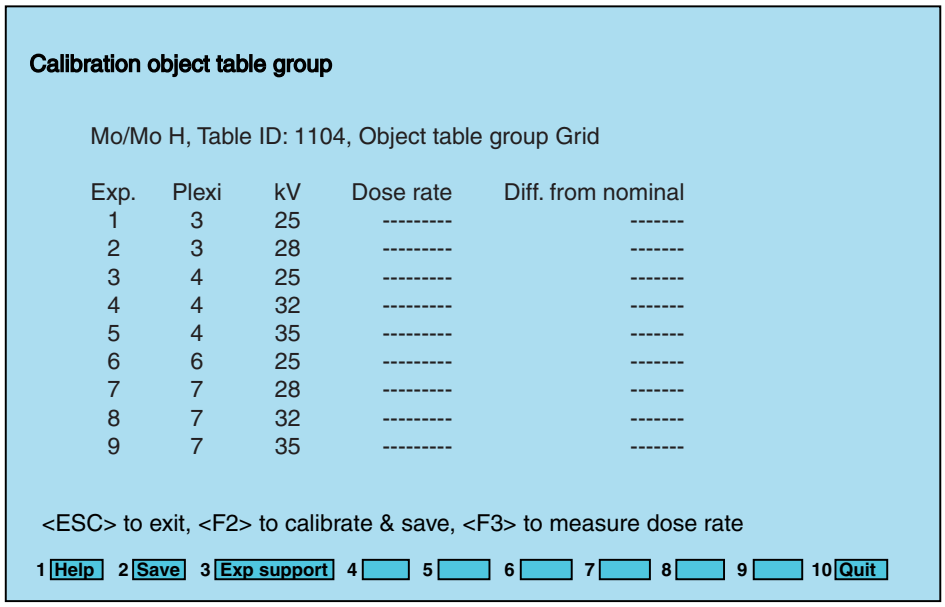
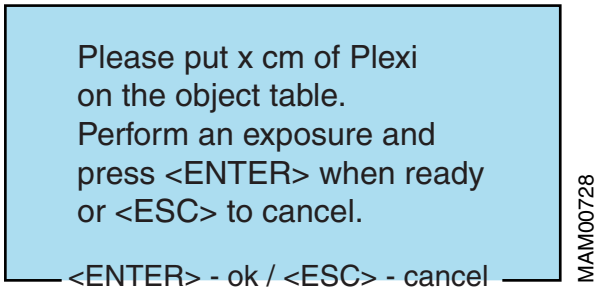

Calibration object table group
Mo/Mo H, Table ID: 1104, Object table group Grid
Exp. Plexi kV Dose rate Diff. from nominal
1 3 25 --------- -------
2 3 28 --------- -------
3 4 25 --------- -------
4 4 32 --------- -------
5 4 35 --------- -------
6 6 25 --------- -------
7 7 28 --------- -------
8 7 32 --------- -------
9 7 35 --------- -------
<ESC> to exit, <F2> to calibrate & save, <F3> to measure dose rate
1 Help 2 Save 3 Exp support 4 5 6 7 8 9 10 Quit
MAM00765

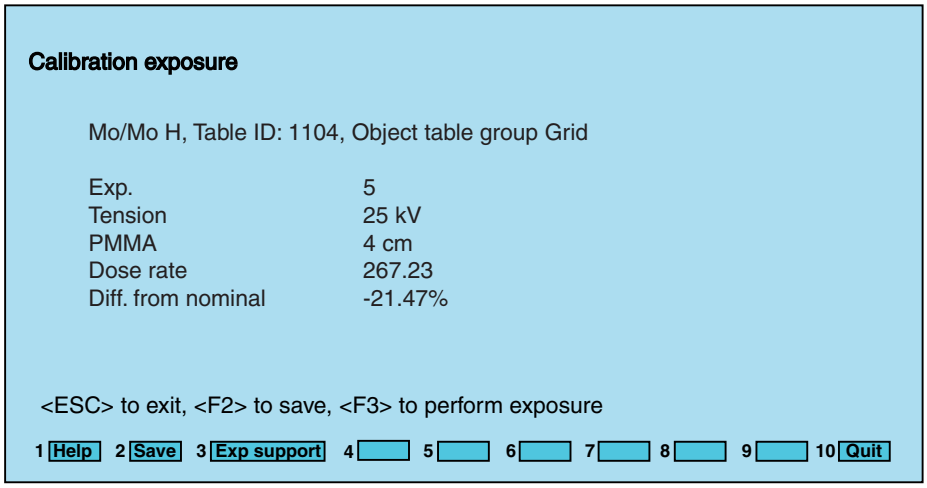
Fig. 6 Dialog *Calibration object table group* shows the dose rates for a number of exposures. The dashed lines below Dose rate indicate that no exposures have been performed yet.

14. To proceed with the calibration, place the cursor by one of the alternatives. Press <F3>.



15. Follow the instructions in the message box shown.

16. When the exposure is done, the dialog *Calibration exposure* appears with values for Dose rate and Diff. from nominal.

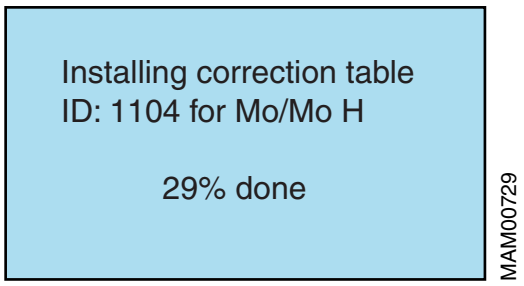

Calibration exposure
Mo/Mo H, Table ID: 1104, Object table group Grid
Exp. 5
Tension 25 kV
PMMA 4 cm
Dose rate 267.23
Diff. from nominal -21.47%
<ESC> to exit, <F2> to save, <F3> to perform exposure
1 Help 2 Save 3 Exp support 4 5 6 7 8 9 10 Quit
MAM00766

NOTE	**If Er 013 occurs, acknowledge it and proceed.**

NOTE	**If the Diff. from nominal exceeds ±50% ensure that the exposure really has taken place, the thickness of AEC calibration plexi are correct and that the cassette (loaded with film) is inserted and repeat the last exposure. If the difference still exceeds ±50% accept the value and proceed.**

17. Save the values with <F2>.

18. Repeat steps 14 to 17 until all exposures are done.
19. When all exposures for one object table group are done, save the values with <F2> in the dialog *Calibration object table group*.
20. The dialog *Calibration AEC correction table* appears. Select the next object table group and repeat steps 5 to 19.
21. When all desired object table groups are calibrated, press <F2> to install the calibrated correction table in the AEC.



Recalibration of an object table

An already calibrated object group can be recalibrated.

NOTE	**Make sure the backup floppy is inserted.**

1. Repeat the procedure described in steps 1 to 4, page 11 - 14.
2. To recalibrate a correction table for an object table group, place the cursor in front of the group. Press <F4>. This will reset the existing calibration of the chosen object table group and replace it with the original correction table stored on the floppy.
3. Press <F2> to save.
4. Recalibrate the desired object table group according to the normal procedure, from step 2, page 11 - 14.

Sensitivity correction (fine setting)

NOTE	Make sure the backup floppy is inserted.

NOTE	From this point on a compression plate may be used.

When all desired object table groups are calibrated, a fine setting of the sensitivity correction should be performed for all available object tables.

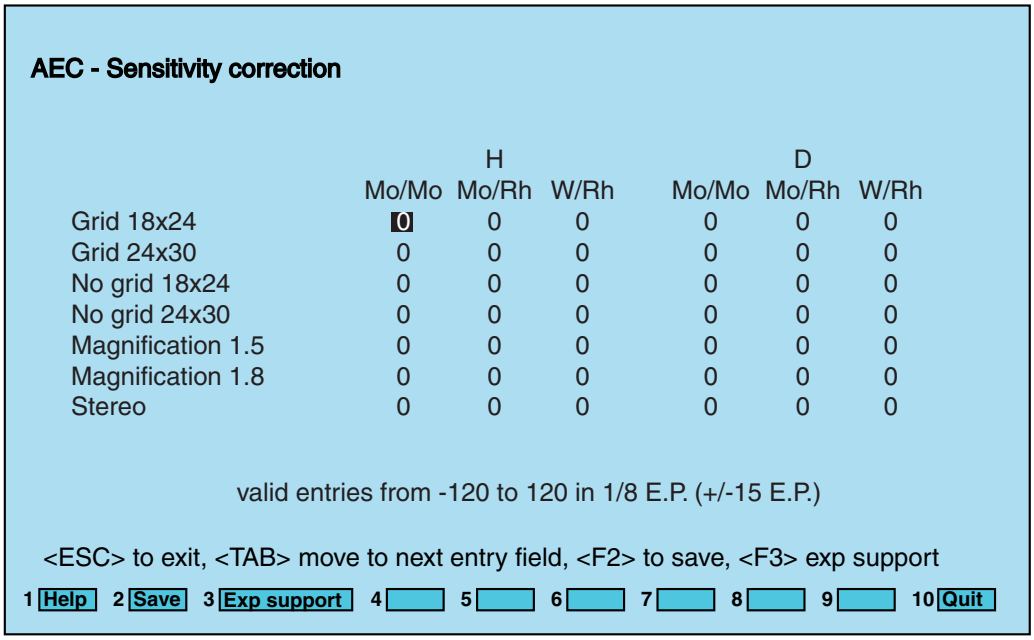
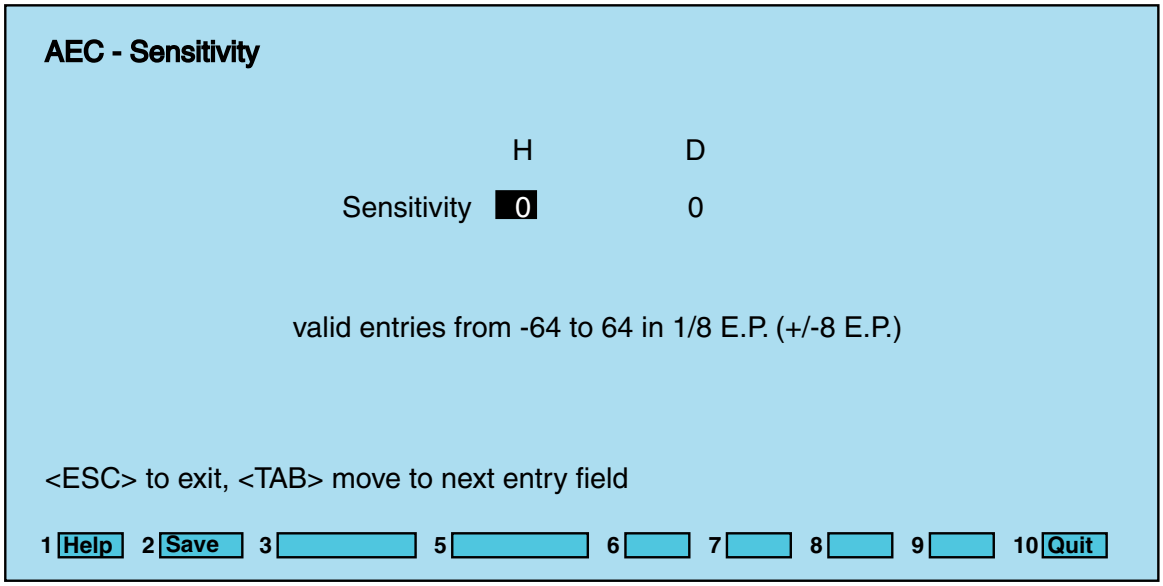

AEC - Sensitivity correction
H
D
Mo/Mo Mo/Rh W/Rh Mo/Mo Mo/Rh W/Rh
Grid 18x24 0 0 0 0 0 0
Grid 24x30 0 0 0 0 0 0
No grid 18x24 0 0 0 0 0 0
No grid 24x30 0 0 0 0 0 0
Magnification 1.5 0 0 0 0 0 0
Magnification 1.8 0 0 0 0 0 0
Stereo 0 0 0 0 0 0
valid entries from -120 to 120 in 1/8 E.P. (+/-15 E.P.)
<ESC> to exit, <TAB> move to next entry field, <F2> to save, <F3> exp support
1 Help 2 Save 3 Exp support 4 5 6 7 8 9 10 Quit
MAM00532

Fig. 7 Set the sensitivity correction for all desired object tables.

1. In <Mainmenu> select <Configuration>, <AEC> and <Sensitivity correction>.
2. Install an object table.
3. Insert the reference cassette, with a new film, in the object table.
4. Select <F3> for support and perform an exposure.
5. Remove the exposed film, make a sensitometer strip and develop the film. Measure O.D. in the measuring point and correct the value according to "Correction of the measured Optical Density (O.D.)" on Page 11 - 7.
6. If the value differs from 1.5 O.D. (or by customer preferred) adjust the values in dialog *AEC - Sensitivity correction* (Fig. 7). Repeat the procedure described in steps 2 to 6. Save with <F2>.
7. Repeat this procedure for the other object tables if applicable.

Sensitivity

Adjustment of O.D. for the whole AEC is performed under <Mainmenu>, <Configuration>, <AEC> and <Sensitivity>.



MAM00654

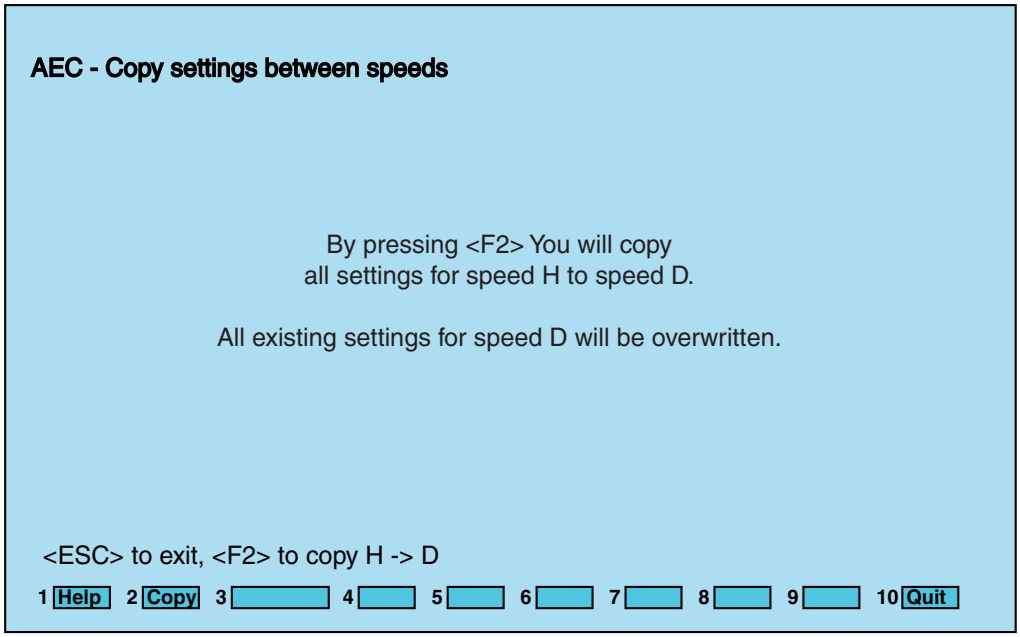
NOTE	**The O.D. preferred by the customer can be set with this function. The customer's own phantom(s) can also be used.**

Copy H to D

If you do not install correction tables for different film/screen combinations on H and D respectively, it is important to have the same settings on both H and D.

Perform a backup to assure that the calibration cannot be lost.

1. Make sure the backup floppy is inserted.
2. In <Mainmenu> select <Backup>, <Copy installation area to floppy> and <All>.
3. In <Mainmenu>, <Configuration> and <AEC> select <Copy H to D>.


AEC - Copy settings between speeds
By pressing <F2> You will copy
all settings for speed H to speed D.
All existing settings for speed D will be overwritten.
<ESC> to exit, <F2> to copy H -> D
1 Help 2 Copy 3 4 5 6 7 8 9 10 Quit
MAM00623

4. Press <F2>. A dialog will appear during copying from H to D. When copying is completed the message “Transfer successful” appears.

General

If desired, the Dose Calculation System can be enabled. This is done by starting the Dose Calculation Program in the service PC.

Enable/Disable Dose Calculation

Choose Enable/Disable Dose Calculation from the Main menu in the Dose Calculation Program.

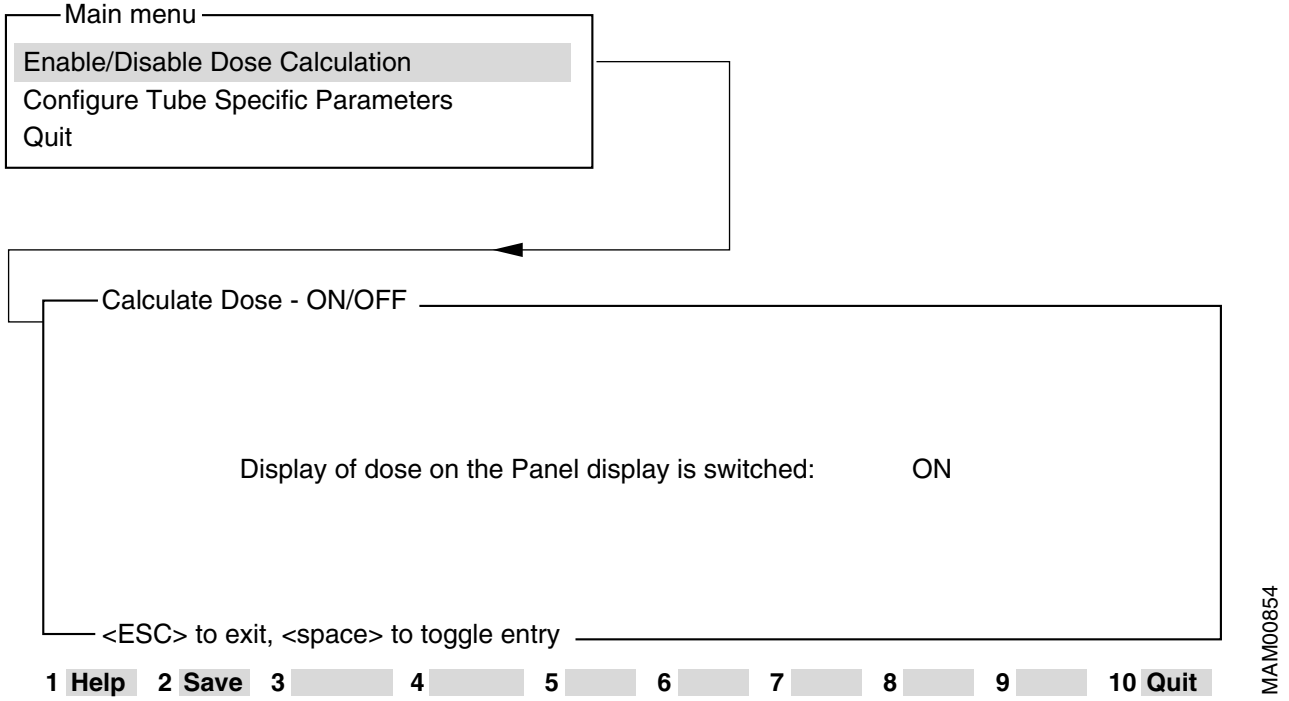

Main menu
Enable/Disable Dose Calculation
Configure Tube Specific Parameters
Quit
Calculate Dose - ON/OFF
Display of dose on the Panel display is switched: ON
<ESC> to exit, <space> to toggle entry
1 Help 2 Save 3 4 5 6 7 8 9 10 Quit
MAM00854

Fig. 1

To show calculated dose values on the control console, enable this option (ON). The dose will be showed in the mAs/mGy display (Fig. 2), the value shown will shift from mAs to dose with approximately 2 second intervals.

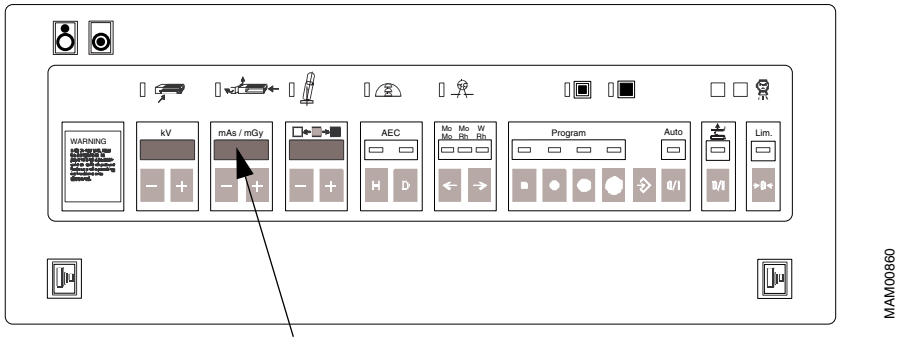


Fig. 2 mAs / mGy value

NOTE	**Selecting "OFF" will only prevent dose values from showing in the mAs/mGy display. Dose calculations will still be performed, and can be shown on print-out if the printer option is installed.**

Configuring of Dose Calculation System

The Dose Calculation System comes with factory default values. Normally, the factory default values should be used. If desired, measurements of HVL (Half Value Layer) and Dose Exchange factors can be performed to improve the accuracy of displayed dose value. These measurements should be performed by the hospital's medical physicist, and are described in the document "Radiographic Handbook, Dose Calculation System, SPB7-230.206.01...". The measuring procedure is quite complicated, and should only be performed by a physicist familiar to similar measurements. If the HVL and Dose Exchange values are to be measured, the document "Service Program" describes how to enter the values in the Dose Calculation Program.

If reinstalling factory default parameters, all previously entered measured data (HVL values and Dose exchange factors) will be lost. However, the measured data should already be noted in the document "Radiographic Handbook".

Label

If the Dose Calculation System is enabled, affix a mAs / mGy label over the "mAs" text on the control and display panel. The label is found in register 3 of the Technical Manual binder.

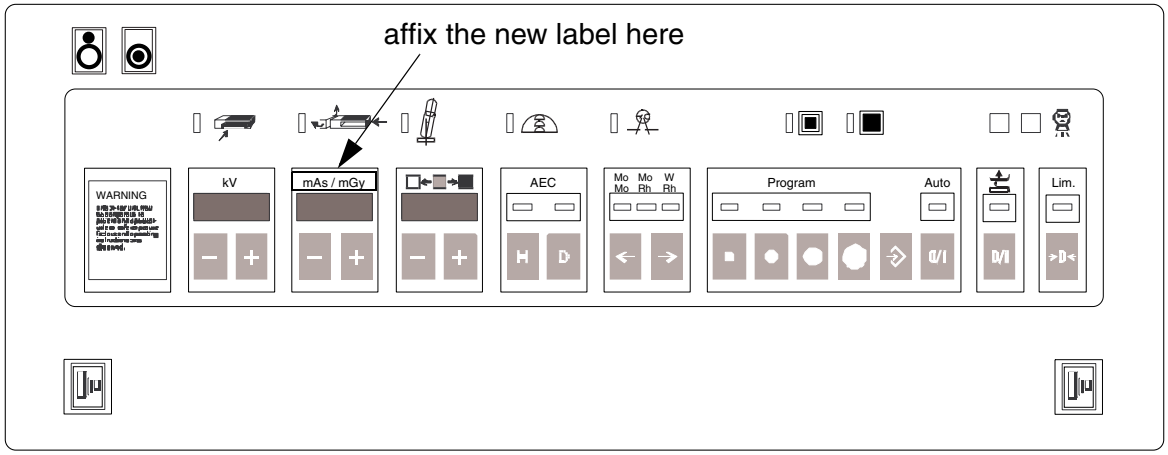


Fig. 3

Testing the AEC-function

AEC performance test

Testing of the AEC-function is to be performed according to the test protocol, and for the object tables in question. (Should error codes Er013 or Er450 appear; change to AEC calibration plexi which is 1 cm thinner.) Mark the exposed films with exposure conditions and store them together with the test protocol.

NOTE	**Tolerance only valid for film/screen combinations listed in Table 1 under "Checking and programming with the service PC" on Page 11 - 1.**

These limits apply for film with max. incremental gamma 5.0.

NOTE	**It is important to make sensitometer exposures on all films to be measured.**

Testing and adjusting OPDOSE

The unit is factory-set with the following values, which are to be regarded as recommendations. Changes can be made with the service PC program (**Configuration, Miscellaneous, Auto limits)**.

Thickness	kV	Anode/filter combination
≥ 61 mm	26	W / Rh
46 - 60 mm	27	Mo / Rh
31 - 45 mm	27	Mo / Mo
0 - 30 mm	26	Mo / Mo

Fig. 1 Installations with filter disc Mo 0.030 / Rh 0.025 /Rh 0.050

Thickness	kV	Anode/filter combination
≥ 61 mm	28	Mo / Rh
46 - 60 mm	27	Mo / Rh
31 - 45 mm	27	Mo / Mo
0 - 30 mm	26	Mo / Mo

Fig. 2 Installations with filter disc Mo 0.030 / Rh 0.025

Thickness	kV	Anode/filter combination
≥ 61 mm	29	Mo / Mo
46 - 60 mm	28	Mo / Mo
31 - 45 mm	27	Mo / Mo
0 - 30 mm	26	Mo / Mo

Fig. 3 MAMMOMAT 1000 installations with single filter from serial no. 7400 / software version 4.2

When making test exposures, follow the instructions on Page 11 - 8 for positioning the AEC calibration plexi and measuring the density.

1. Mains voltage and system ON.
2. Mount an 18x24 cm compression plate to the MAMMOMAT 3000/3000 Nova.
3. Select a thickness of AEC calibration plexi, that is within the thickness interval of the program to be tested. The thickness intervals can be found in <Mainmenu>, <Configuration>, <Miscellaneous> and <Auto limits>. For more information about Auto limits, see Chapter " Miscellaneous -> Auto limits" in the service manual "Service Program" for MAMMOMAT 3000/3000 Nova.
4. Select AUTO on control panel.
5. Place the AEC calibration plexi on the object table in question and compress to 6 kg or more.
6. Check that the correct program is blinking on the control panel. Select the program by pressing the corresponding program button on the control panel.
7. Check the optical density (O.D.) by making exposure on film. The O.D. shall be as close to 1,5 as possible (or the density preferred by customer). If necessary adjust density correction on control panel. Save with the store button.
8. Repeat the procedure described in steps 3-7 for the other used programs.
9. Note the OPDOSE settings in the attached test protocol.

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Setting the real time clock

Prerequisite

The correct date and time must be set in the service PC. If not set date at C:\> by typing **date <**ENTER**>** and time at C:\> by typing **time <**ENTER**>.**

Setting the time in the MAMMOMAT

Main menu:

1. Select <Configuration>.
2. Select <Clock>.
3. Press <F2>.
   With <F2> the date and time set in the service PC are taken over by the MAMMOMAT.

Reducing the generator power

NOTE	**If the power is reduced after calibrating and adjusting the AEC, a new calibration will be necessary!**

To achieve full power, the measured resistance must not exceed the following values:

- 0.25 Ω at 110 V (1-phase)
- 0.45 Ω at 208 V
- 0.50 Ω at 230 V
- 0.60 Ω at 240 V
- 0.65 Ω at 277 V
- 0.85 Ω at 400 V (2-phase)

If the above values are exceeded, reduce the generator power as follows:

Main menu:

1. Select <Configuration> <Miscellaneous >.
2. Select <Red. of power>.
   Reduction of power depending on line quality.
   Tube is P 40 MoW.
3. Select nominal line voltage ____ V with cursor keys <↑> <↓> and < ENTER>.
4. Type in line impedance ____ Ω. Enter the measured line impedance.
   Calculated power is ___ kW. Max. possible tube power is displayed.
5. Save the programmed values with <F2>.

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Rotary motion

1. System "OFF".
   The rotary motion and the vertical adjustment of the swivel-arm system shall be blocked.

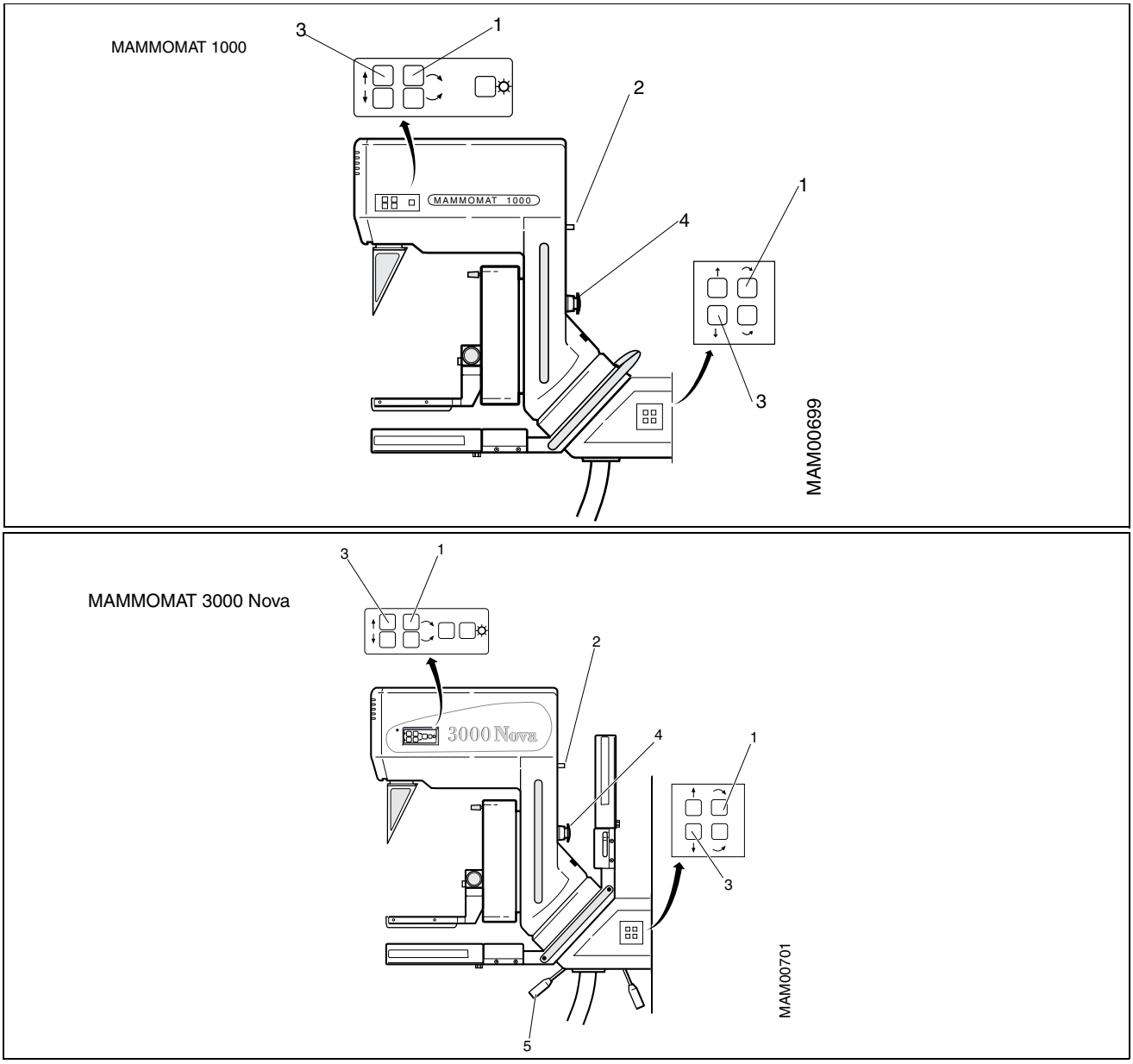

Fig. 1 Swivel-arm system

2. System "ON", object table installed and projection angle set to minimum with presetting knob (2/Fig. 1).
3. Check the rotary motion of the swivel-arm system by pressing buttons (1/Fig. 1) one by one.
   The rotation of the swivel-arm system shall stop when the button is released or when end position is reached (+135 degrees clockwise and -180 degrees counterclockwise). The projection angle is shown on the display at the lower part of the stand.

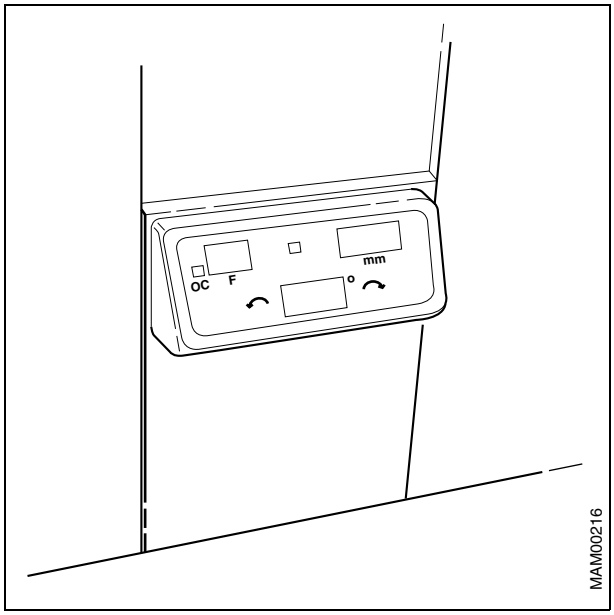

Fig. 2 Display at the lower part of the stand

4. Set the projection angle to 60 degrees with presetting knob (2/Fig. 1).
   The preset angle is displayed for approx 3 s.
5. Press one of the buttons (1/Fig. 1).
   The rotary motion of the swivel-arm system shall stop automatically when the preset projection angle (both + and -) is reached and at 0 degrees.

NOTE	**All eight rotary motion buttons (four on either side) must be checked. After the button has been released, the swivel-arm system shall remain in the position set.**

Vertical adjustment

⚠CAUTION	**Remove the protective strips before performing vertical adjustment of the swivel arm.** **If not removed, the protective strips could be damaged.** **Make sure the protective strips are removed before adjustments., see page 3 - 5.**

1. Press the buttons for upward and downward movement (3/Fig. 1) of the swivel-arm system.
   The movement shall stop automatically when either end position is reached or when the button is released.

NOTE	**All eight vertical adjustment buttons (four on either side) must be checked. The switching off in upper and lower end position is effected by switches S881 and S884 respectively.**

Emergency stop

1. Press the emergency stop button (4/Fig. 1).
   The button shall latch and all motorized movements of the equipment shall be blocked ("Er 824" shall appear). To reset the emergency-stop button, turn it clockwise.

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Checking and adjusting the field light time

Checking the field light time

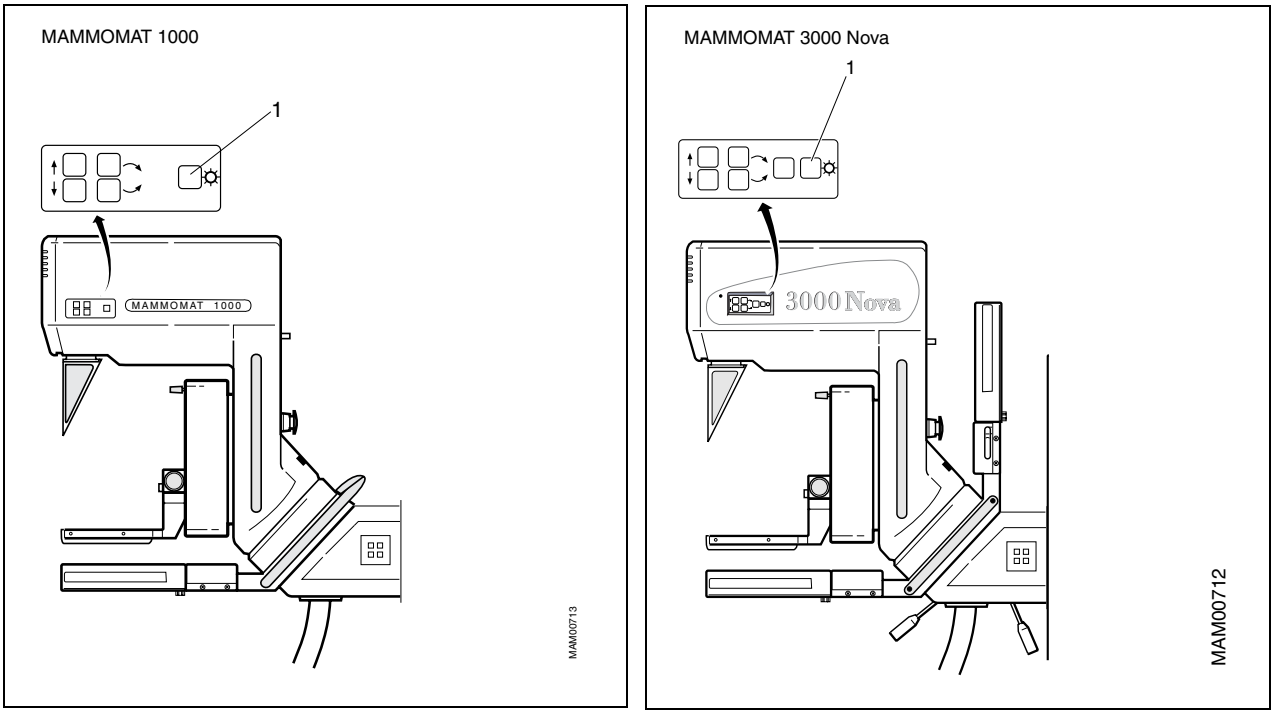

Fig. 1 Field-light switch

1. Switch on the field light by pressing switch (1/Fig. 1) or by pressing the compression foot switch (2/Fig. 2).
   The field light shall go out automatically after a preset period of time (normally 20 s.).

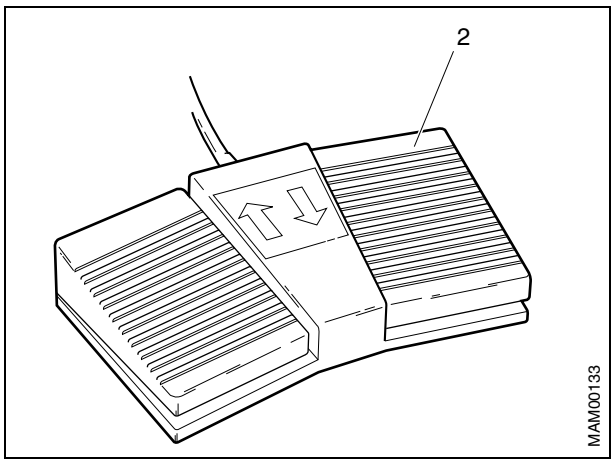

Fig. 2 Foot switch

Adjusting the field light time

The illumination time of the light field can be adjusted according to the customer´s desire within a certain range.

NOTE	**Shorter illumination time means increased life time of the lamp.**

1. Connect the service PC to the generator and start the program as described in Chapter 22 "Appendix".
2. Program according to the following:

Main menu:

1. Select <Configuration>.
2. Select <Miscellaneous>.
3. Select <Illumination time>.
4. Type in illumination time and save with < F2>.

Checking the compression device

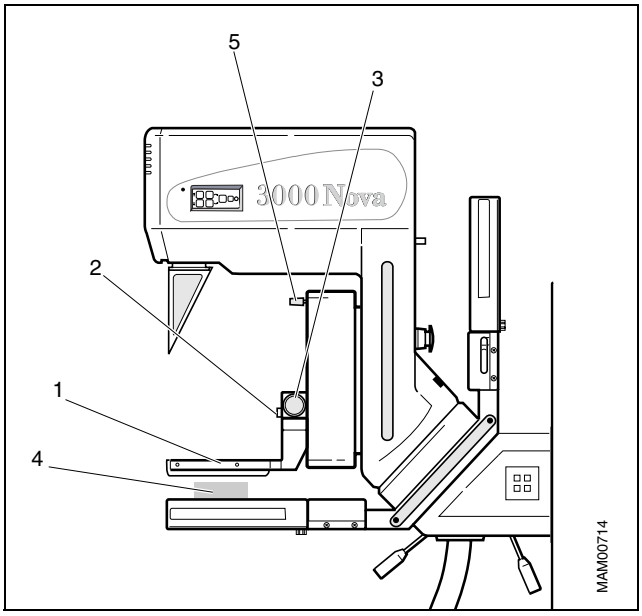

Fig. 1 Swivel-arm system

1. Attach compression plate (1/Fig. 1) if not already done.
2. Check that the compression plate cannot be removed without pressing the compression plate release button (2/Fig. 1).
3. Check the function of the knobs for manual compression/decompression (3/Fig. 1).
4. Place a piece of soft material on the object table, for example a rolled up towel or a piece of foam-rubber (4/Fig. 1).
5. Check the function of the foot switch for motorized compression/decompression (1) and (2) in (Fig. 2).

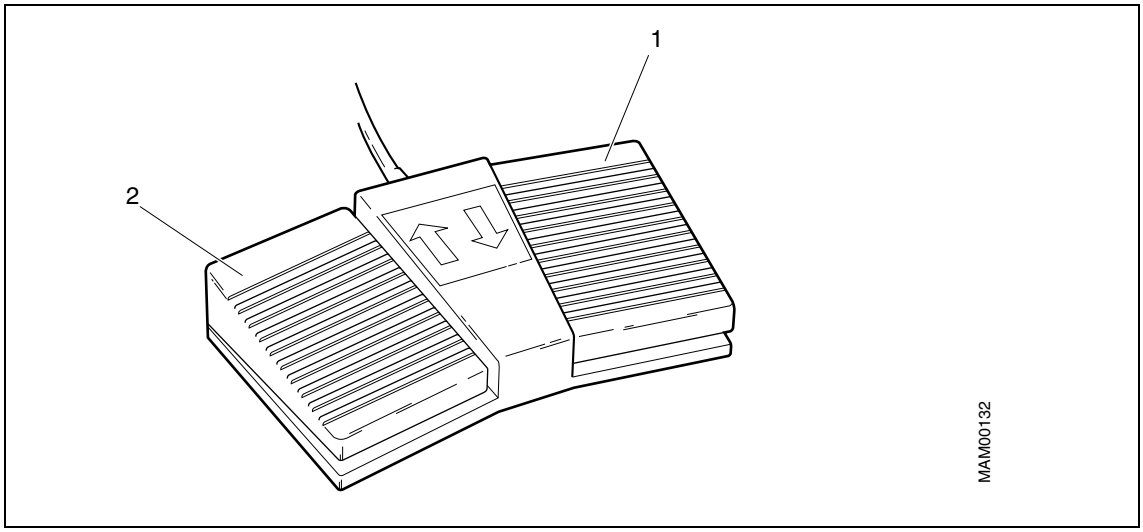

Fig. 2 Foot switch

6. Press the foot switch for motorized decompression to move the compression plate upwards while at the same time pressing the compression plate in the opposite direction by hand.
   The upward movement of the compression plate shall now stop (safety switch).
7. Set the compression to 7 kg by using the presetting knob (5/Fig. 1).
   The preset compression force appears on the display at the lower part of the stand (1/Fig. 3).

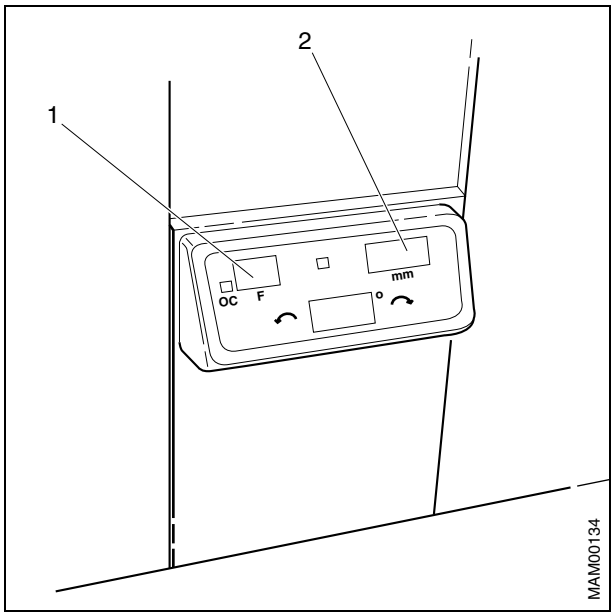

Fig. 3 Display at the lower part of the stand

8. Press the foot switch for motorized compression to move the compression plate downwards while simultaneously pressing the compression plate in the opposite direction by hand.
   The compression plate shall now slow down and stop, when the preset compression force is reached.

NOTE **During compression, the motorized vertical adjustment as well as the rotary motion of the swivel-arm system shall be blocked.**

Decompression button (only with separate control console)

Check the decompression button on the separate control console for proper function, i.e. that the compression plate moves upwards when the button is pressed.

Checking the OPCOMP

1. Decompress.
2. Set the compression force to 20 kg by using the presetting knob (5/Fig. 1) and compress.
   The compression movement must be interrupted by OPCOMP before 20 kg is reached, i.e. at 5-15 kg depending on the material (4/Fig. 1) used.

Adapting OPCOMP

If the factory-set OPCOMP is not to the customer's satisfaction, an adjustment can be done with the tautness factors in the "Best compression table", see Service Instructions. A lower tautness value will increase the compression force and vice versa.

- Increase/decrease the tautness factor by e.g. 10 the first time. Let the customer use this setting for at least two weeks, before further changes are made.

NOTE

OPCOMP has been thoroughly tested by Siemens. If any factors are changed, OPCOMP will no longer be an optimization of compression force and image quality according to Siemens' clinical test.

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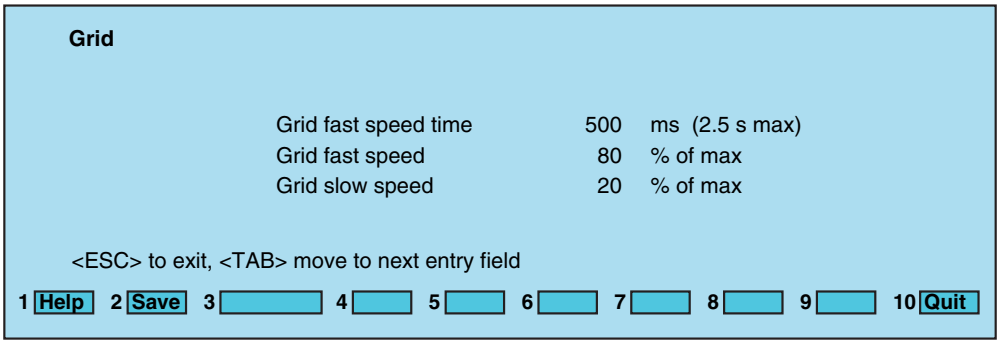
DLF switch on

Activate the DLF switch. In <Main menu> select <Configuration>, <Miscellaneous> and <DLF switch>, press space to set switch to ON. Press <F2> to save.

Reduce grid speed

Reduce the grid speed. In <Main menu> select <Configuration> and <Grid speed>. Set the following values:


Grid
Grid fast speed time 500 ms (2.5 s max)
Grid fast speed 80 % of max
Grid slow speed 20 % of max
<ESC> to exit, <TAB> move to next entry field
1 Help 2 Save 3 4 5 6 7 8 9 10 Quit
MAM00762

Cassette loaded switch on

Set the cassette loaded switch on.

NOTE	**The "cassette loaded" switch must be set to "ON" with the service PC program.**

NOTE	**The film cassette must be exchanged after each exposure. A second exposure before exchanging the cassette is not possible (exposure release is blocked).**

Checking the exposure blocking

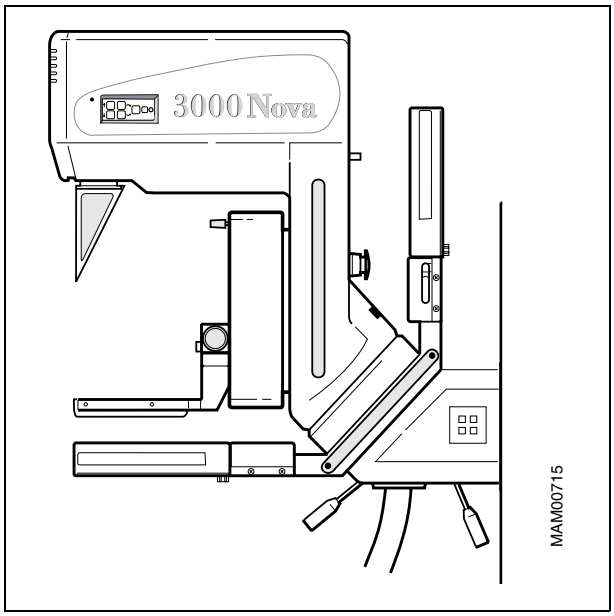


Fig. 1 Swivel-arm system

Check that the exposure release is blocked during the following conditions:

- No film cassette inserted.
- No object table installed.

General

The nominal width of the radiation field is 248 mm (18×24 mode) and 308 mm (24×30 mode). The nominal depth of the radiation field is 191 mm (18x24 mode) and 243 mm (24x30 mode), adjusted so that there will be no white edge on the film.

- On the chest wall side, the radiation field must extend beyond the film edge but not more than 9 mm. That applies for both the 18x24 and the 24x30 mode.
- On the sides, the radiation field must not extend outside the object table and not extend more than 13 mm outside the film.
- On the nipple side, the radiation field must not extend beyond the film edge by more than 13 mm.

The light field must coincide with the radiation field within the following tolerances:

Left edge:	±6.5 mm
Right edge:	±6.5 mm
Back edge:	±6.5 mm
Front edge:	±6.5 mm

Measuring procedure

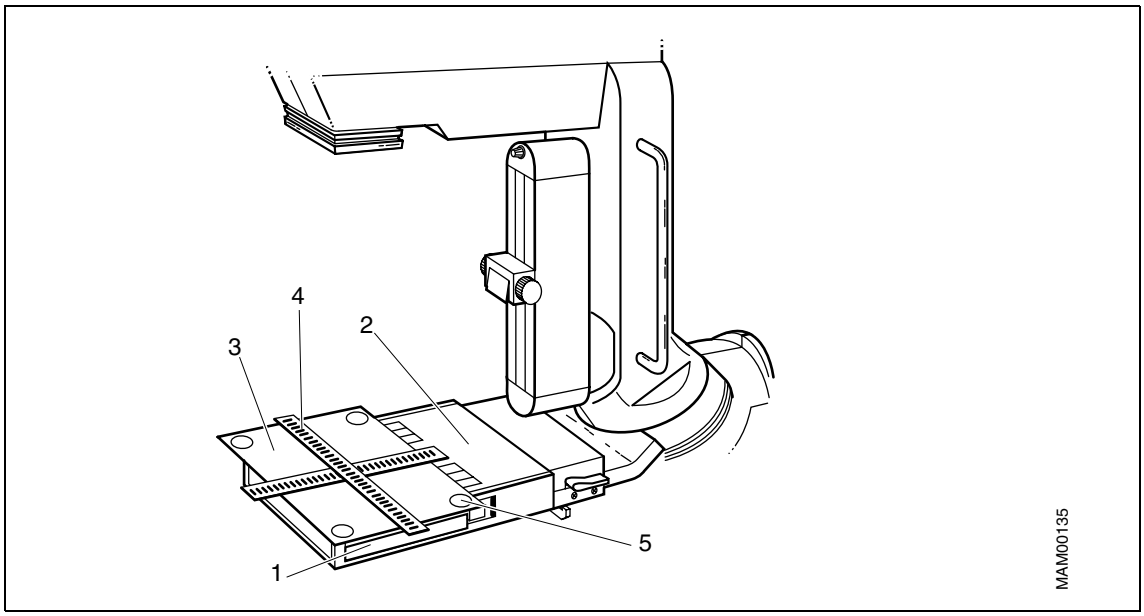


Fig. 1 Checking the radiation field

1. Put film into the cassette (1/Fig. 1). The film shall be centered in the cassette.
2. Insert the cassette into the object table (2/Fig. 1).
3. Place the film bag (3/Fig. 1) on the object table. The film bag must extend beyond the chest wall edge by minimum 10 mm.
   If no corresponding film bag is available, you can place two film cassettes side by side on the object table.
4. Place a centering cross (4/Fig. 1) on the film bag or cassettes.
5. Switch on the light field and mark the edges of the light field with four coins (5/Fig. 1).
6. Write down the values of the centering cross corresponding to the side edges and the front edge of the object table.
7. Release exposure (Mo/Mo).
8. Develop exposed films.

Evaluation

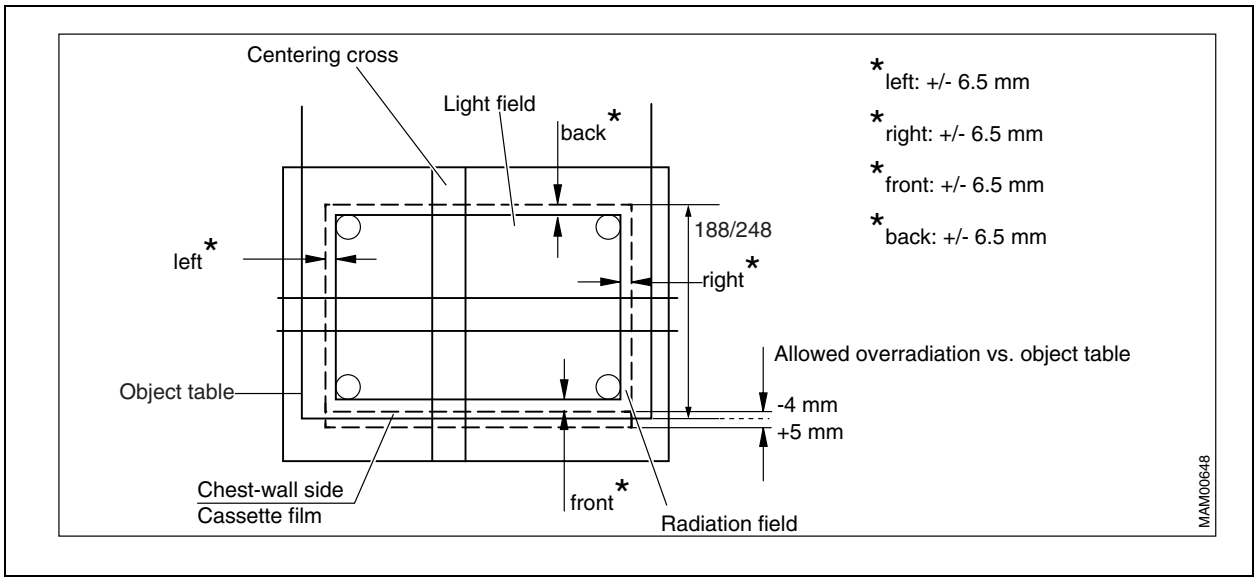


Fig. 2 Field limitation

NOTE	**Values for evaluation are defined in the plane of the film bag.**

Alignment radiation field/light field

1. On the film that was placed in the film bag, mark the light field limit with guidance of the coin marks as shown in (Fig. 2) above.
   The maximum divergence between radiation field and light field of 6.5 mm must not be exceeded on any side.

Radiation field limitation

1. Measured from the chest wall side of the object table, the radiation field must be within -4 and +5 on the chest wall side and must not exceed 188 mm (18x24 film) and 248 mm (24x30 film) on the nipple side.
2. The radiation field must under no circumstances extend beyond the side edges of the object table. The margins to the edges must at least be 7 mm. Compare the side values read off on film-bag film with the corresponding values written down in step 6 above.

Correction, see Service Instructions.

3. Finally check the radiation field on a film exposed inside the object table.
   18x24 film must be completely exposed on all sides. 24x30 film might have up to 3 mm white edge on the nipple side[1]. The other sides must be completely exposed.

Repeat this check with all object tables and both "wings" (base plates).

1. adjust within the given tolerance in step 1 above if necessary

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Service PC and measuring instruments

Saving the configuration file

NOTE	Make sure that the backup floppy is inserted.

Main menu:

1. Select <Configuration> <Save config file>.
2. Press <F2> to save data.

Reading the exposure counter

Main menu:

1. Select <Service> <Show exposure counter>.
2. Enter the current counter reading in the certificate.

Deleting the error memory

Main menu:

1. Select <Service> <Delete error buffer>.
2. Delete the error memory with <Y>.

Saving the programmed values

Main menu:

1. Select <Backup> <Copy installation area to floppy> <All>.
2. Leave the program with <F10> when the backup is ready.

NOTE	Keep the backup floppy with other documentation for the MAMMOMAT in question.

Removing the measuring instruments

1. Turn OFF the generator.
2. Remove the service PC.
3. Remove connected measuring instruments.

Checking the protective grounding resistance

Using the protective ground-wire tester, measure the resistance between the protective ground terminal in the stand (X899, see Chapter 5 "Cable connections") and all metallic parts of the equipment which the patient/operator may come in contact with, incl. all object tables. The protective ground resistance must not exceed 0.1 Ω.

Mounting the cable duct covers

If not already done, mount the cable duct covers, see Chapter 4 "Installing the generator and the stand".

Mounting the stand covers

⚠WARNING

The edges of the metal curtain of the stand are very sharp.

They may cause severe injury.

Remove the protective strips carefully when the covers are to be mounted. Store the strips in the holders provided on both sides of the curtain.

NOTICE

When mounting the stand covers, make sure that the screws at the top of the stand are securely tightened and have functioning contact washers.

These screws are used to establish protective ground connections.

MAMMOMAT stand

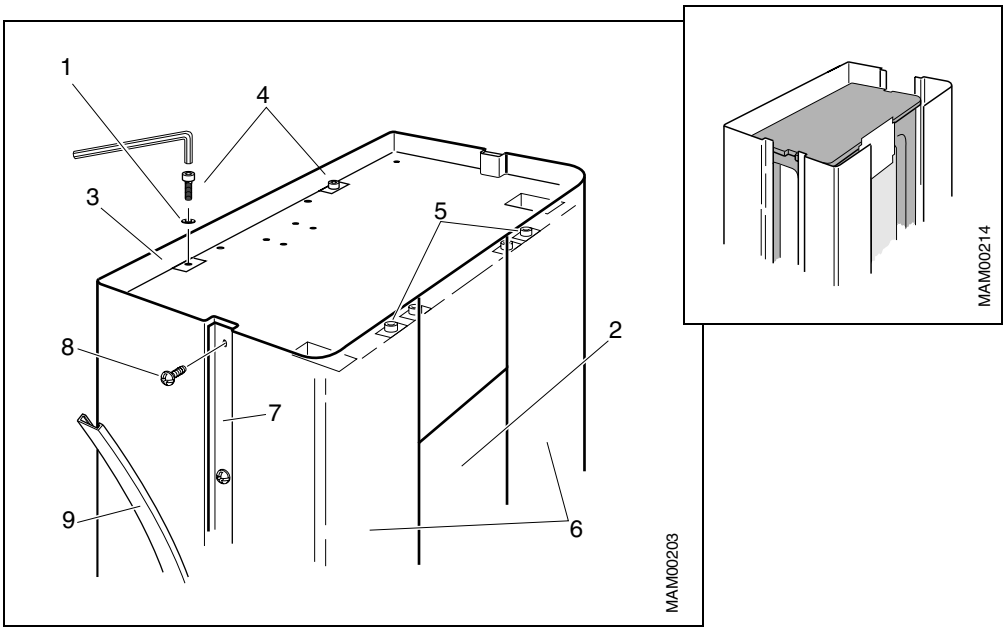

Fig. 1 Mounting the stand covers on a stand with single rear cover.

The covers are delivered with a protective plastic film, which shall be removed and discarded.

1. Make sure that clips are positioned over the holes where the screws (8) are to be fastened. These clips enable the screws to fasten the covers.
2. Fit left and right front covers (6) to the stand and fasten with screws and contact washers (5).
3. Fit the rear cover (3) to the stand and fasten it with screws (4) and contact washers (1).
   Be careful not to damage the cables at the cable outlet!
4. Fit inner plastic strip (7) to the front and side covers and fasten with screws (8), eight on either side.
5. Press on the outer plastic strip (9).

Fitting the MAMMOMAT cap

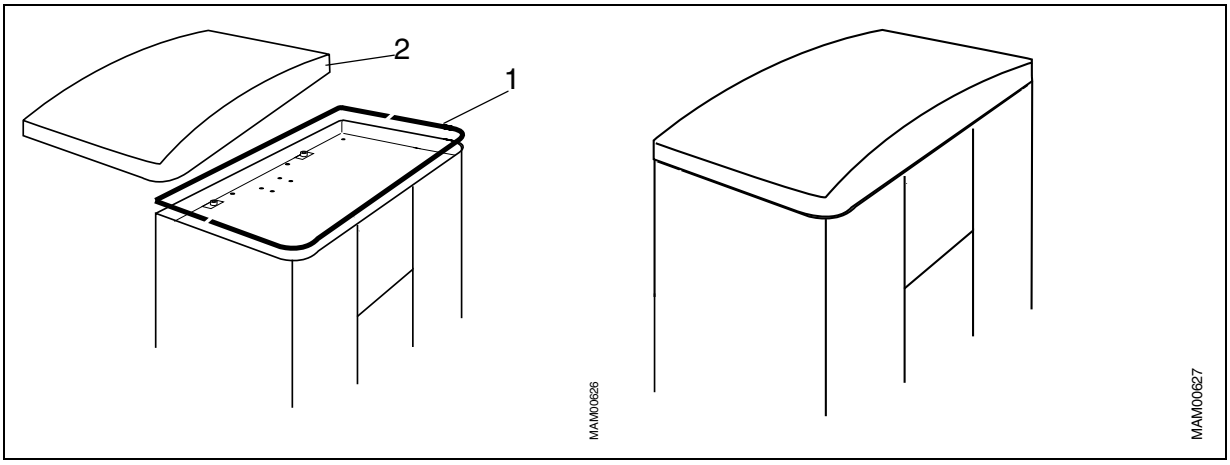

Fig. 2 MAMMOMAT cap

1. Fit the rubber strip on the edge of the stand (1).
2. Place the cap on the top of the MAMMOMAT (2).

Fitting the cable outlet cover

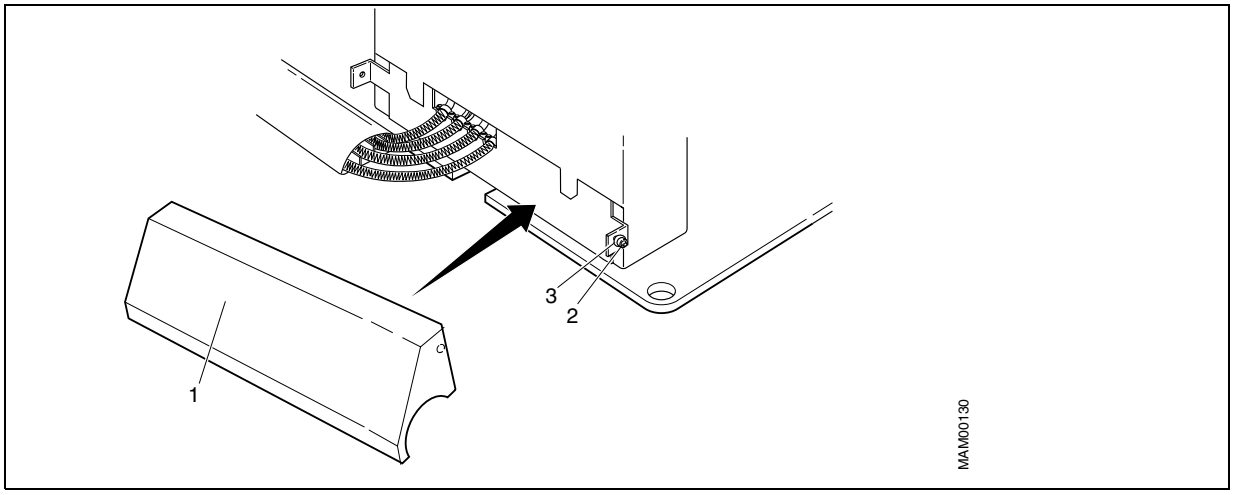

Fig. 3 Cable-outlet cover

1. Fit the cable outlet cover (1) to the stand and fasten with screws (2) and contact washers (3).

Mounting the front cover onto the generator

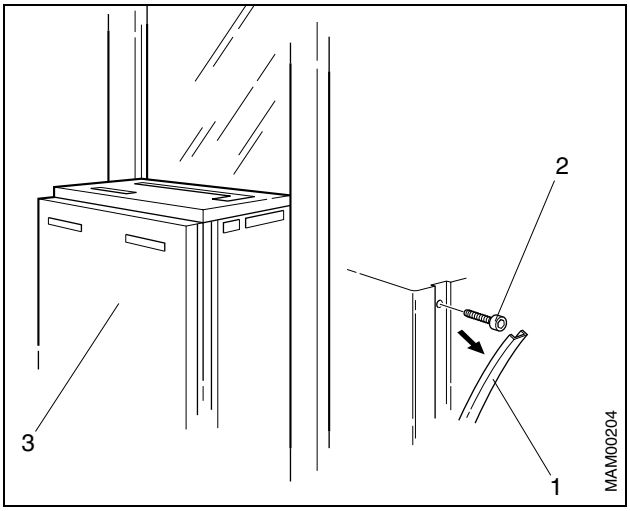

Fig. 4 Mounting the front cover

1. Fit the front cover (3) to the generator and fasten it with sixteen screws (2).
2. Press on the outer cover strip (1).

NOTICE

When attaching the front cover, make sure that all eight contact washers (four on either side) are used again as in the original assembly (under the screws with clearance holes in the plastic strips).

The screws must be securely tightened and the washers must be functional. This is necessary to establish protective ground connection.

Final protective grounding resistance test

Using the protective ground wire tester, measure the resistance between the mains grounding connection (incl mains cable) and any metallic part of the stand and generator which the patient/operator may come in contact with.

The protective ground resistance must not exceed 0.2 Ω.

Face shield

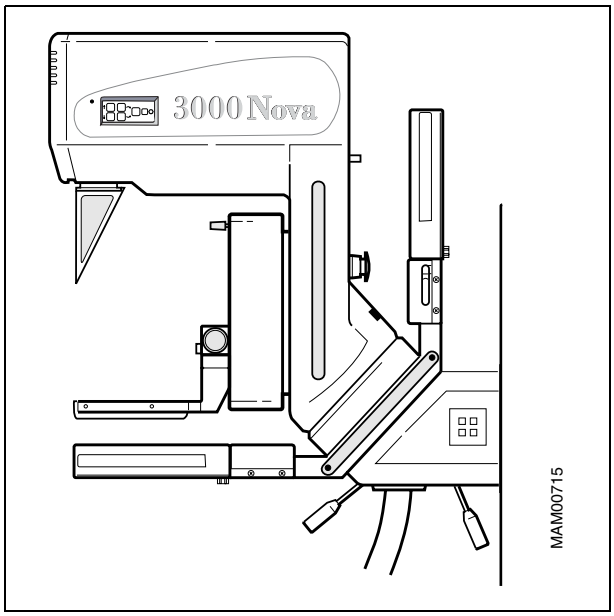

Fig. 5 Face shield

1. Slide the face shield (1) onto the holder for external diaphragms.

Warning label on control panel

The control-panel warning label comes in eleven languages; English, German, French, Spanish, Italian, Dutch, Danish, Norwegian, Finnish, Greek, and Swedish. The warning labels are found in a plastic bag under thumb index 3 in the Technical Manual.

NOTE	**Warning label in english is provided on delivery.**

Choose appropriate language and affix the label over the existing label on the control panel, see Fig. 6. Be sure to position the label properly before affixing it. The label sticks immediately.

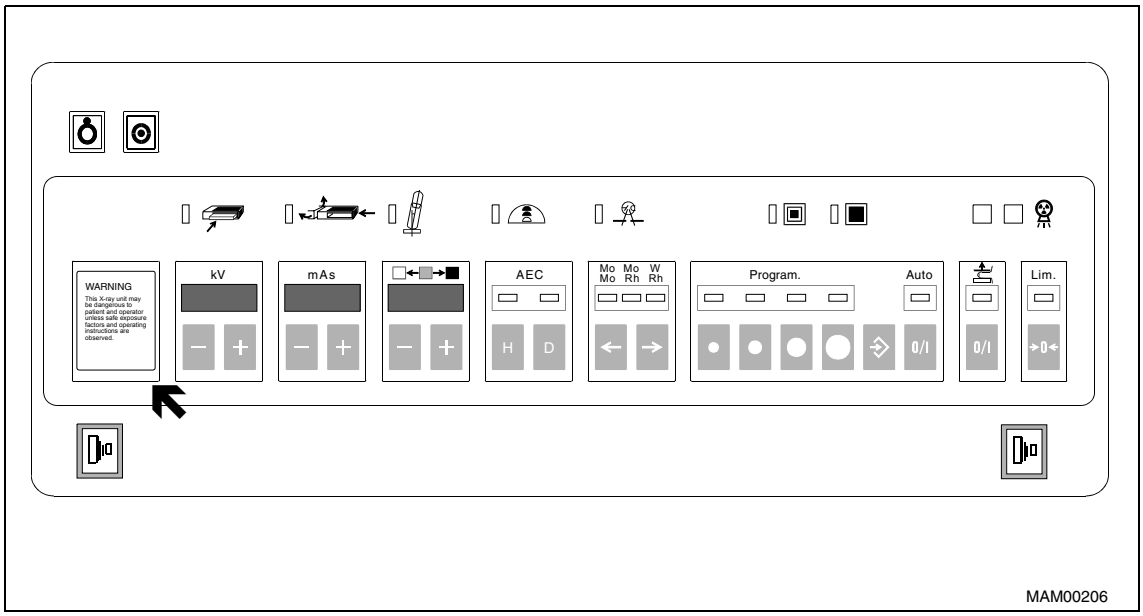

Fig. 6 Warning label on control panel

Affixing the identification labels

The identification labels for the stand are enclosed in a plastic bag. The plastic bag is filed under index tab 3 in the technical manual.

1. Remove the protective film from the back of the identification-label plate.
2. Affix the plate on the right side cover down at the foot of the stand as shown in Fig. 7. Be sure to position the plate correctly before pressing it onto the side cover. The adhesive sticks immediately.

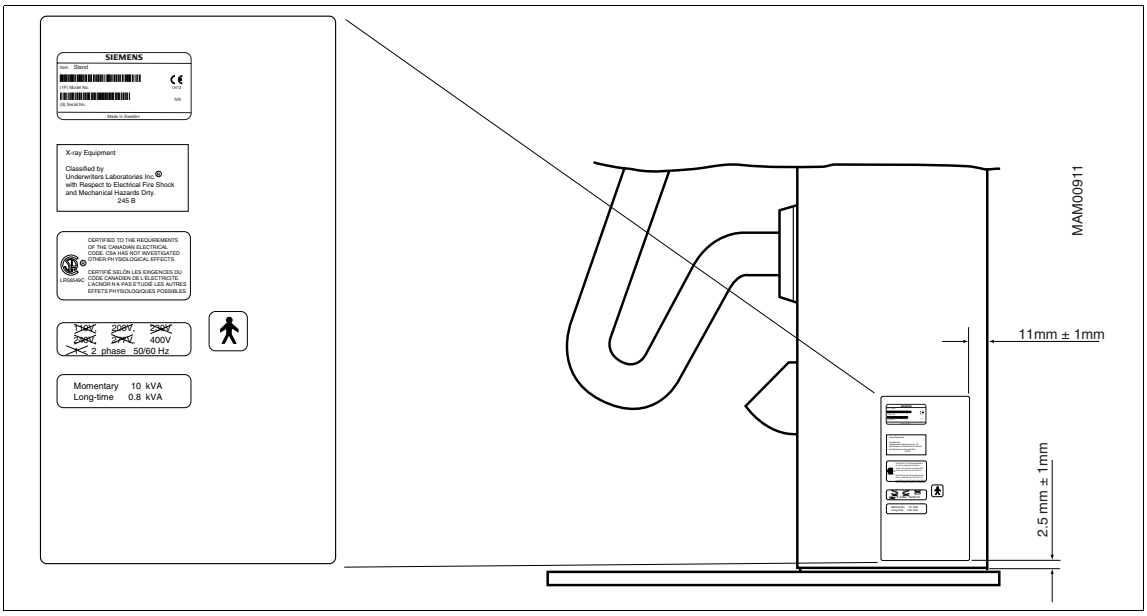

Fig. 7 Affixing the identification labels

Reporting IVK status

Fill in the IVK list or report the IVK components to your responsible uptime service center (USC).

Other installation material

The metal plates (article no. 65 52 728 and 65 61 026) are to remain with the customer, for future use. Keep them with other material and documentation for the MAMMOMAT in question.

Handling the Installation report

The manufacturer of this product requires information and the legislator demands proof that a system delivered free of defects from the factory continues to possess the required and certified quality properties after installation, start-up and putting-into-operation, (also called: Assembly, Installation, Adjustment and Testing, abbreviated as: AIAT).

It is, therefore, absolutely necessary that the Installation report with the installation and start-up data is sent without delay after completion of work to the address stated on the installation report.

You will find the report in the system folder. The Installation report has to be handed over to the responsible project manager (PM), who has to make sure that it will be sent to the address, or fax number, printed on it. It is not foreseen to hand over this Installation report to the customer.

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Stand and generator with integrated radiation shield and control panel

Should a permanent fastening to the floor be required due to local regulations (for example in earthquake areas) or due to the quality of the floor covering, the stand/generator can be secured to the floor by means safety dowels and screws. When bolting the stand to the floor, the fixing screws shall pass through the hollow levelling screws (1).
When bolting the generator with integrated radiation shield and control panel to the floor, the pre-drilled fixing holes (2) shall be used.

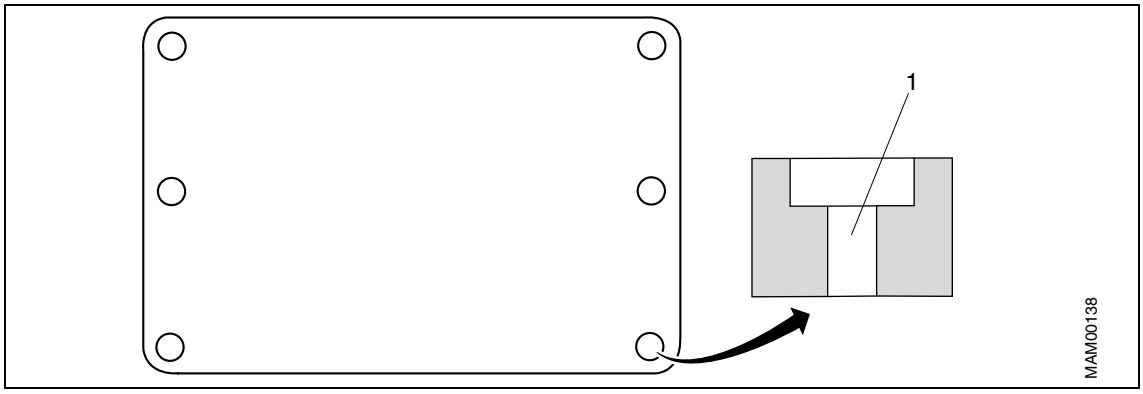

Fig. 1 Base plate for the stand

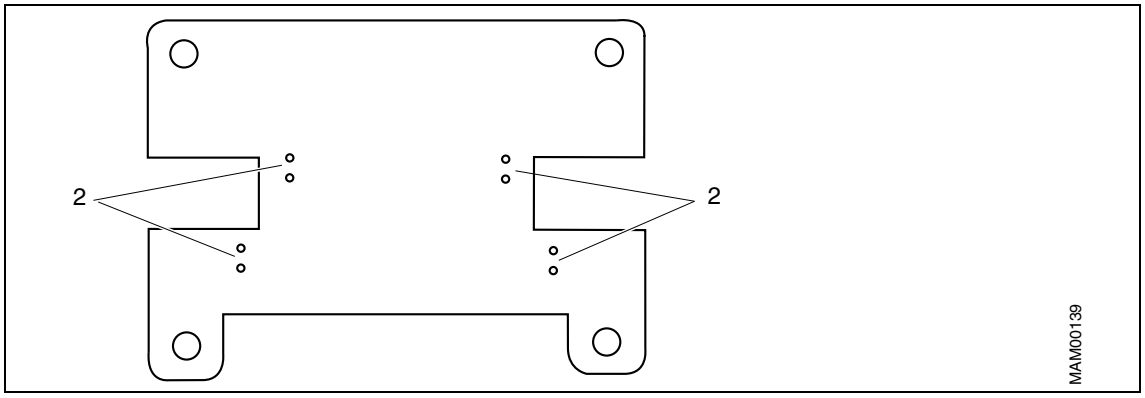

Fig. 2 Base plate for the generator

1. Position the stand /generator and mark out appropriate fixing holes on the floor, using the base plate as a template.

NOTE	**The base plates shall be secured with at least four screws each (two on either side).**

2. Drill the holes and insert dowels and screws (use Liebig safety dowel M6 S10/35 and washer DIN 9021B, ISO 7093 or equivalent. Tighten the screws to 10 Nm.

NOTICE

The screws must not come in contact with any conductive material such as reinforcing iron, since the grounding could be compromised.

Make sure to stay clear of conductive material when fastening the screws.

Installation with separate generator

The separate generator **must** be bolted to the floor and/or be secured to the wall by means of the enclosed wall brackets. For bolting the separate generator to the floor, the same procedure as for generator with integrated control panel and radiation shield applies, see page 21 - 1.

For attaching the wall brackets to the generator, the uppermost screw hole for the lead-glass stanchions shall be used. Ensure that the wall brackets are secured to the wall with adequate safety margins. Dowels and screws are not supplied. Please obtain these locally and ensure that they are suitable for the material used in the wall.

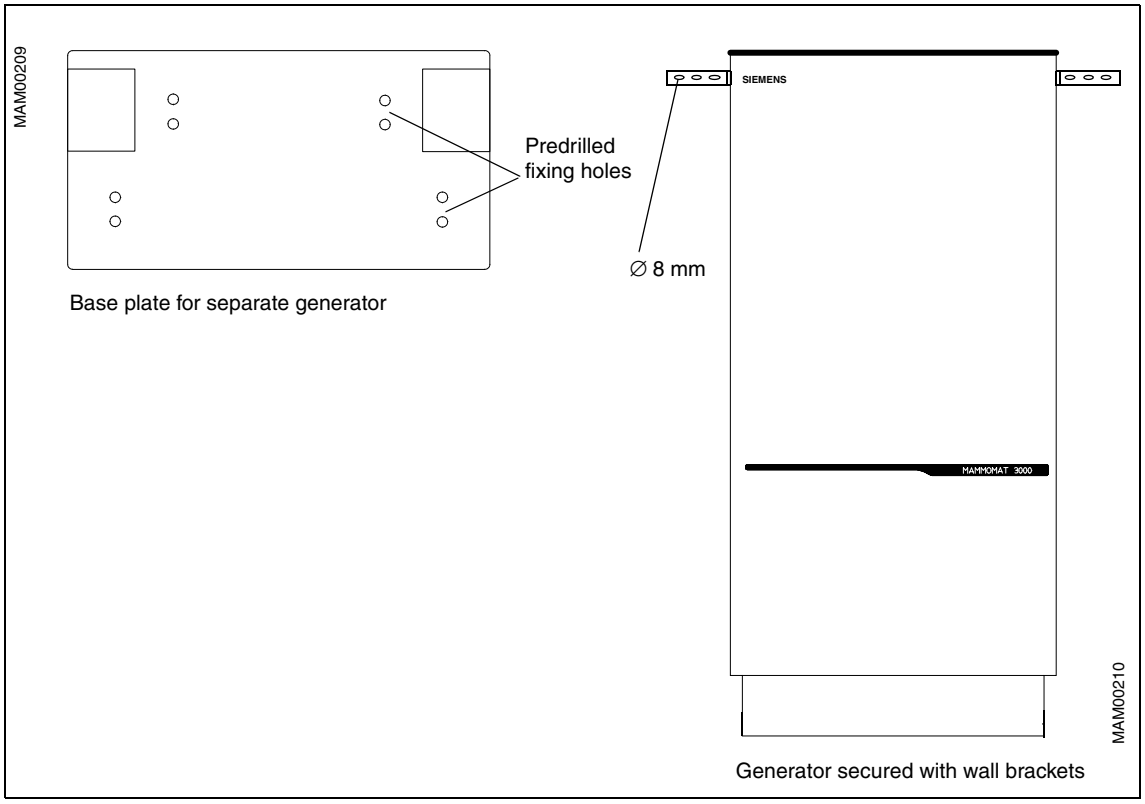

Fig. 3 Base plate and wall brackets for separate generator

Free-standing radiation shield (option)

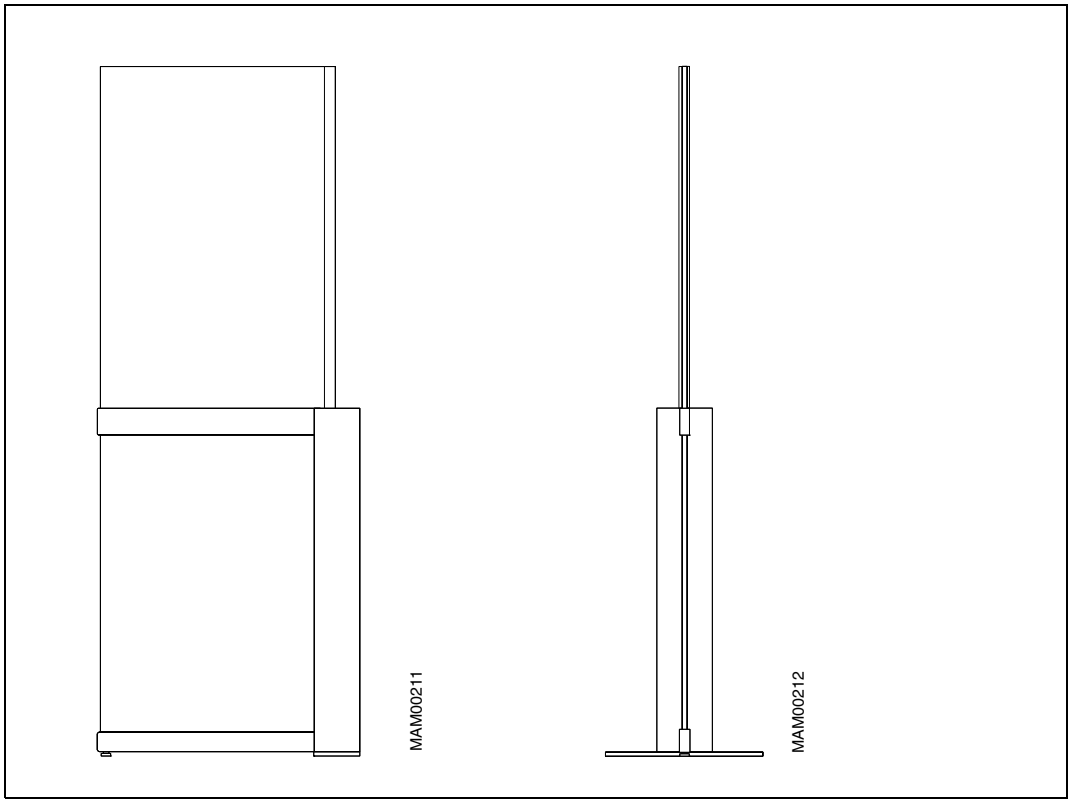

Fig. 4 Free-standing radiation shield

The free-standing radiation shield must be bolted to the floor, see separate instructions enclosed with the radiation shield.

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Working with the service PC

Description of the syntax used in these instructions

<.....>	The indication of which function keys to press is given between these characters, for example <ENTER>, <ESC> etc.
CAPITALS	Capital letters indicate data which must be entered unchanged, for example the name of a register, files etc.
Italics	Italics represent data in which a value should be entered, e.g. for user name, the name of the technician should be entered.
[.....]	Square brackets enclose additions to commands which may be optionally entered.
Bold	Data relating to formats, user entries etc., which is important for the following entry, is shown in bold as it appears on the monitor screen.
———	This character indicates that at this point the space key must be pressed.
xx yy zz	Data can be entered in place of *"x, y, z"* (e.g. day´s date).
{...}	Curved brackets indicate that out of several terms listed one below the other, one must be selected.
	Important remarks are indicated with this box.
* * * * *	When the password is entered, only these characters are shown.
Menu Selection:	When several menus, programs, files etc. are presented for selection, they are shown in a box (program window). Selection is made with the <↓> and <↑> keys. The module selected is highligthed in the display.
<ENTER>	Every entry must be confirmed with the <ENTER> key.
<ESC>	ESC allows paging back through the program.
<xx> + <y>	Some functions are selected by pressing two keys simultaneously. Procedure: Press, for example, the <Shift> key and keep it depressed, press the <*> key and then release both keys.
<F1>	Key <F1> calls up a selective help text.
<F10>	Key <F10> exits the program.
PLD	Programmable Logic Device on the AEC board (D701).
Flash	Memory device on the AEC board (D701).
OS	Operating System, e.g. "Microsoft® Windows®"

BIOS	Basic Input and Output System, a program stored in the computer hardware which launches start-up functions upon computer power-up.
XXX - - XXX - - XXX - - XXX	This shows where a particular subroutine can be found. For example: **Main menu** – **Configuration** – **AEC**– **Sensitivity correction-**

Connecting the service PC

The service PC must be connected with connecting cable part no. 99 00 440 RE999 to p.c. board in the generator (do not insert the diskette in the drive yet).

Configuration of the service PC

All Service Programs use the RS232 port in order to communicate with the MAMMOMAT. This port is usually handled as COM1 by the OS of the service PC. Modern PC's can be equipped with new types of communication hardware, e.g. infrared port and built-in modem, which may act as COM1 or share resources with COM1. This could cause malfunction of the Service Programs for the MAMMOMAT, which requires the OS and computer BIOS to be re-configured.

The following procedures are designed to ensure general compatibility with the OS's Windows® 95, Windows® 98 and Windows® 2000 Pro on modern PC's. If the settings are saved, this procedure has to be done only once.

Configuration of computer BIOS

1. Enter the BIOS setup, usually done by pressing e.g. <F2> during the boot sequence of the BIOS.
2. Find the configuration of the IrDA (Infrared device) port and disable it.
3. Find the configuration of a built-in modem and make sure it is configured as COM3.
4. Find the configuration of COM1 and make sure it uses the interrupt IRQ 4 and the memory address range 03F8 - 03FF.
5. Save the BIOS settings and restart the PC.

Configuration of Windows®

(This example is for Windows® 2000 Pro. Windows® 95 and Windows® 98 has a similar approach, consult the OS documentation for details.)

1. Choose Settings from the Start Menu.
2. Choose Control Panel.
3. Choose System.
4. Choose the tab Hardware.
5. Press the button Device Manager.
   If the IrDA-port was disabled in the computer BIOS, it should not be present in the list of available hardware. If the IrDA is present anyway and its icon is not marked with a red cross:
6. Double-click on the device row.
7. Choose the tab General In the appearing dialog box.
8. In the section Device Usage, change the status to "Disabled in the current hardware profile".
9. Exit the dialog by pressing the OK-button.

Having performed the described configurations above, the Service Program should be able to communicate without difficulties.

Starting up and using the service PC

1 Switch on generator and service PC.

After initialization, the service PC shows: **C:\>**

2 Now insert the diskette with the service program.

3 Select the appropriate drive {A:} {B:} and then press <ENTER>.

The screen shows: **A:\>** or **B:\>**

4 Start the service program by typing 'SERVICE' (extension -c if you have a color display), then press <ENTER>.

The program asks for the user's name: ***Your name, please***

Type the name of the technician, for example NN, and then press <ENTER>.

5 The program asks for the password: ***Password, please***

Type the password (********) and then press <ENTER>.

The display window shows: ***Main menu***

6 Select the program part to be used with keys <↑> and/or <↓>, then press <ENTER>.

The program part selected is shown with a background: ***Configuration***

If necessary, additional subroutines can be similarly selected here.

7 Make the necessary entries in the appropriate part of the program.

Save the entered data with <F2>. Page back in the program with <ESC>.

The appropriate instructions are shown on the monitor.

End the procedure with the service PC with <F10>.

Starting up and using the service PC - Dose Calculation program

1. Switch on generator and service PC.
   After initialization, the service PC shows: **C:\>**
2. Now insert the diskette with the dose calculating program.
3. Select the appropriate drive $\begin{matrix}\{A:\}\\{B:\}\end{matrix}$ and then press <ENTER>. The screen shows: **A:\>** or **B:\>**
4. Start the service program by typing "DOSE_CFG", then press <ENTER>.
   The program asks for the user's name: ***Your name, please***
   Type the name of the technician, for example NN, and then press <ENTER>.
5. The program asks for the password: ***Password, please***
   Type the password (********) and then press <ENTER>. This is the same password that is used for the regular service program.
6. The display window shows: ***PROGRAM-MODE; Mode: Normal***
   If ***Mode: Normal*** is the correct choice then press <ENTER> or
   if ***Mode: Stand-alone*** is wanted press the <SPACE> key once and then press <ENTER>.
   The display window shows: ***Main menu***
7. Select the program part to be used with keys <↑> and/or <↓>, then press <ENTER>.
8. Make the necessary entries in the appropriate part of the program. Save the entered data with <F2>. Page back in the program with <ESC>. The appropriate instructions are shown on the monitor.

End the procedure with the service PC with <F10>.

Troubleshooting

If communication with the MAMMOMAT still cannot be established, follow the instructions in this section. The following procedure will disable the buffering of the RS232 port. (This example is for Windows® 2000 Pro. Windows® 95 and Windows® 98 has a similar approach, consult the OS documentation for details.)

1. Choose Settings from the Start Menu.
2. Choose Control Panel.
3. Choose System.
4. Choose the tab Hardware.
5. Press the button Device Manager.
6. Expand the row Ports.
7. Double-click on the COM1 row.
8. Choose the tab Port Settings.
9. Press the button Advanced.
10. Uncheck the check box Use FIFO Buffers.
11. Exit the dialog by pressing the OK-button.

Test protocol

kV-adjustment

Use this protocol with the instructions in "kV-adjustment" on Page 10 - 2.

	Measured value with DVM
Before adjustment	
After adjustment	

Filament

Use this protocol with the instructions in "Filament" on Page 10 - 4.

Anode	Filament current
Large focus molly	
Large focus tungsten	
Small focus molly	
Small focus tungsten	

AEC performance test

To be performed for the object tables, wings, and speeds in question.
ΔOD_{corr} = the difference between the two measured OD_{corr} values in each case.

*Should error codes Er013 or Er450 appear; change to AEC calibration plexi which is 1 cm thinner.

If both speed H and speed D are to be tested, copy the test protocol.

	Film		Screen	
	Manufacturer	Type	Manufacturer	Type
H				
D				

Speed used for the tests below (H/D)

M1000 or Wing 1 M3000 Nova

Grid Table 18x24 (Bucky)		mAs	OD	OD_{below}	OD_{above}	OD_{corr}
Mo/Mo	25 kV, 6 cm plexi*					
Mo/Mo	32 kV, 2 cm plexi					

Tolerances: $\triangle OD_{corr} \leqslant 0.30$ absolute **$\triangle OD_{corr}$**

Grid Table 18x24 (Bucky)		mAs	OD	OD_{below}	OD_{above}	OD_{corr}
Mo/Rh	26 kV, 6 cm plexi*					
Mo/Rh	32 kV, 2 cm plexi					

Tolerances: $\triangle OD_{corr} \leqslant 0.30$ absolute **$\triangle OD_{corr}$**

Grid Table 18x24 (Bucky)		mAs	OD	OD_{below}	OD_{above}	OD_{corr}
W/Rh	25 kV, 6 cm plexi*					
W/Rh	32 kV, 2 cm plexi					

Tolerances: $\triangle OD_{corr} \leqslant 0.30$ absolute **$\triangle OD_{corr}$**

Magnification Table		mAs	OD	OD_{below}	OD_{above}	OD_{corr}
Mo/Mo	25 kV, 5 cm plexi*					
Mo/Mo	32 kV, 2 cm plexi					

Tolerances: $\triangle OD_{corr} \leqslant 0.30$ absolute $\triangle OD_{corr}$

Magnification Table		mAs	OD	OD_{below}	OD_{above}	OD_{corr}
Mo/Rh	26 kV, 5 cm plexi*					
Mo/Rh	32 kV, 2 cm plexi					

Tolerances: $\triangle OD_{corr} \leqslant 0.30$ absolute $\triangle OD_{corr}$

Magnification Table		mAs	OD	OD_{below}	OD_{above}	OD_{corr}
W/Rh	25 kV, 5 cm plexi*					
W/Rh	32 kV, 2 cm plexi					

Tolerances: $\triangle OD_{corr} \leqslant 0.30$ absolute $\triangle OD_{corr}$

Stereotactic Table		mAs	OD	OD_{below}	OD_{above}	OD_{corr}
Mo/Mo	25 kV, 6 cm plexi*					
Mo/Mo	32 kV, 2 cm plexi					

Tolerances: $\triangle OD_{corr} \leqslant 0.45$ absolute $\triangle OD_{corr}$

Stereotactic Table		mAs	OD	OD_{below}	OD_{above}	OD_{corr}
Mo/Rh	26 kV, 6 cm plexi*					
Mo/Rh	32 kV, 2 cm plexi					

Tolerances: $\triangle OD_{corr} \leqslant 0.45$ absolute $\triangle OD_{corr}$

Stereotactic Table		mAs	OD	OD_{below}	OD_{above}	OD_{corr}
W/Rh	25 kV, 6 cm plexi*					
W/Rh	32 kV, 2 cm plexi					

Tolerances: $\triangle OD_{corr} \leqslant 0.45$ absolute $\triangle$**OD$_{corr}$**

Wing 2 M3000 Nova

Grid Table 18x24 (Bucky)		mAs	OD	OD_{below}	OD_{above}	OD_{corr}
Mo/Mo	25 kV, 6 cm plexi*					
Mo/Mo	32 kV, 2 cm plexi					

Tolerances: $\triangle OD_{corr} \leqslant 0.30$ absolute $\triangle$**OD$_{corr}$**

OPDOSE settings

Use this protocol with the instructions in "Dose Calculation System" on Page 12 - 1.

	kV	Density correction	Speed button (H or D)	Anode/filter combination	Breast thickness	OD	OD_{below}	OD_{above}	OD_{corr}
●									
○									
○									
○									

Oscilloscope diagrams

Tube P40 MoW, MAMMOMAT 3000 Nova, tungsten anode 0.3

Calculated values	Required values
_____V x 5 kV/V = _____kV	30 kV ±5%
_____V x ____ s x 40 mA/V = ____ mAs	20 mAs ±10%

Date:_____
Sign:_____

Tube P40 MoW, MAMMOMAT 1000/3000 Nova, molybdenum anode 0.3

Calculated values	Required values
_____V x 5 kV/V = _____kV	30 kV ±5%
_____V x ____ s x 40 mA/V = ____ mAs	20 mAs ±10%

Date:_____
Sign:_____

Tube P40 MoW, MAMMOMAT 3000 Nova, tungsten anode 0.15

Calculated values	Required values
_____V x 5 kV/V = _____kV	30 kV ±5%
_____V x ____ s x 40 mA/V = ____ mAs	10 mAs ±10%

Date:_____
Sign:_____

Tube P40 MoW, MAMMOMAT 1000/3000 Nova, molybdenum anode 0.15

Calculated values	Required values
_____V x 5 kV/V = _____kV	30 kV ±5%
_____V x ____ s x 40 mA/V = ____ mAs	10 mAs ±10%

Date:_____
Sign:_____

Tube P40 MoW, MAMMOMAT 3000 Nova, tungsten anode 0.3, AEC-mode

40 mm Plexiglas

Calculated values	Required values
_____V x 5 kV/V = _____kV	30 kV ±5%
_____V x 40 mA/V = ____ mA	158 mA ±10%

Date:_____
Sign:_____

Tube P40 MoW, MAMMOMAT 1000/3000 Nova, molybdenum anode 0.3, AEC-mode

40 mm Plexiglas

Calculated values	Required values
_____V x 5 kV/V = _____kV	30 kV ±5%
_____V x 40 mA/V = ____ mA	125 mA ±10%

Date:_____
Sign:_____

Keep the measuring protocol with the technical documentation.

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Chapter 11	Page 1	Table 1 was extended. Therein the correlation between the available AEC-Correction tables and some additional film/screen combinations were published as released.
Chapter 20	Page 9	Paragraph "Handling the Installation report" was added.

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